INVESTIGATING HOME ENVIRONMENT INFLUENCES ON OBESITY IN URBAN EGYPTIAN CHILDREN AGED 2-12

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Declaration

The thesis named above has been submitted for the degree of Doctor of Philosophy. I, Mahmoud Shaltout, hereby declare that:

- I am the sole author of this thesis.
- I have fully acknowledged and referenced the ideas and work of others, whether published or unpublished, in my thesis.
- I have prepared my thesis specifically for the degree of Doctor of Philosophy while under supervision at the University of Salford.
- My thesis does not contain work extracted from a thesis, dissertation or research paper previously presented for another degree or diploma at this or any other university
- My quantitative methodology has been carried out with the assistance and collaboration of the El Zanaty & Associates research agency in Cairo, Egypt. While I was present at the implementation of the data collection phase, the anthropometric measurements (of both women and children) and the surveys were administered by female research assistants in accordance with cultural norms.
- My qualitative methodology was administered by myself in an international school setting, due to political instability. The anthropometric measures (of women) were taken by the school's female physician, in accordance with cultural norms.

Abstract

The home environment is highlighted as a key determinant of children's weight, but has not been investigated in Egypt. As a result this mixed methods study was undertaken to examine (1) relationships between the home environment and Egyptian children's (aged 2-12) weight (2) socio-economic differences in home environments (3) caregivers' perceptions of obesity, and (4) children's dietary and physical activity (PA) habits. Firstly, the Healthy Home Survey (HHS), was administered to households ($n = 210$) in three different SES areas in Cairo, examining the food and PA environment (including availability/accessibility and parental modelling/policies). Then semi-structured interviews with caregivers ($n = 17$) explored parental perceptions of obesity and children's dietary/PA habits. The HHS indicated that after adjusting for age and gender, greater accessibility to unhealthy food ($p < 0.01$), less PA on weekends ($p < 0.01$), greater sedentary weekday activity ($p < 0.01$), and unhealthier parental PA modelling ($p < 0.01$) significantly predicted lower childhood weight. Higher SES areas and income groups had significantly better outdoor area characteristics ($p < 0.001$), and significantly more healthy and unhealthy ($p < 0.001$) food availability and greater media availability ($p < 0.001$). Interviews indicated that: caregivers perceived obesity as predominantly a female issue; children were defined as eating well by quantity (not quality); parents were stricter on daughters' weights for aesthetic purposes; boys engaged in more outdoor play; PA settings differed among children from different SES areas; and unhealthy food was available in all households, but differed between SES areas in nature and affordability. This study recommends more detailed investigation of home environment variables (particularly food availability/accessibility, sedentary behaviours and cultural perceptions) on obesity in Egypt, as well as a need to initiate family based obesity awareness and intervention programmes.

List of Abbreviations

BMI: Body Mass Index

CAPMAS (Egypt): Central Agency for Public Mobilisation and Statistics

CDC: Centers for Disease Control and Prevention

DH: Department of Health

EDHS: Egypt Demographic and Health Survey

HHS: Healthy Home Survey

IASO: International Association for the Study of Obesity

LE: Egyptian Pounds (national currency)

MER: Middle East Region

NOO: National Obesity Observatory

PA: Physical Activity

SA: Sedentary Activity

SEM: Socio-Ecological Model

SES: Socio-economic Status

WC: Waist Circumference

WHO: World Health Organisation

WHR: Waist-to-hip Ratio

WtHR: Waist-to-Height Ratio

Chapter 1 Introduction

The obesity epidemic is currently a worldwide problem; over 1.4 billion people are overweight and at least 200 million men and 300 million women are obese according to the World Health Organisation (WHO) (2012). Although mainly an issue in developed countries, particularly among the lower socio-economic status (SES) groups (Kinra, Nelder, & Lewendon, 2000; Song, 2006; McLaren, 2007; OECD, 2012; Drewnowski, et al., 2013; Nogueira, et al., 2013), obesity prevalence is also rising in developing countries such as Egypt (El-Zanaty & Way, 2009; Aitsi-Selmi, et al., 2012) where 64.5% of adult males and 76% of adult females are obese (WHO, 2010). Childhood obesity prevalence is also increasing worldwide, as 43 million children under the age of 5 were classified as overweight/obese, most of whom were from developing countries (de Onis, Blössner, & Borghi, 2010; Low, 2010). Prevalence of childhood obesity in Egypt is also increasing, particularly in urban areas (Salazar-Martinez, et al., 2006; El-Zanaty & Way, 2009). According to the National Obesity Observatory (NOO) (2010), various factors influence obesity, namely biological factors, activity environment, food environment and societal influences. The latter three make up the Socio-Ecological Model (SEM) of public health, which examines a public health use from various levels of environmental influences (Cassel, 2010; Williams, 2011). The home environment, which includes both the activity and food environment, has only recently been studied as a comprehensive factor behind childhood obesity (Bryant, et al., 2008; Gattshall, Shoup, Marshall, Crane, & Estabrooks, 2008; Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008; Johnson, Welk, Saint-Maurice, & Ihmels, 2012; Tandon, et al., 2012).

Research is scarce on the relationships between home environment influences and childhood weight/obesity in Egyptian households. This is of great importance, as obesity and associated illnesses such as Type 2 diabetes pose a heavy financial burden on society (NOO, 2011; NHS, 2011; DH, 2012) as well as reducing productivity (Gates, Succop, Brehm, Gillespie, & Sommers, 2008; Tsai, Ahmed, Wendt, Bhojani, & Donnelly, 2008). These issues are quite important for a lower middle income country like Egypt (World Bank, 2013; UNICEF Egypt, 2010; Holden, Poole, Morgan, & Currie, 2011) and more so given the recent 2011 revolution and its economic impact on the country (Khan, 2012). Moreover, the importance of family in Egyptian culture (Aldinger & Bauernfeind, 2001; U.S. Library of Congress, 2011) made the home environment and familial influences important when studying environmental influences of obesity in Egypt.

This study was based on the Socio-Ecological Model (SEM) of public health, and drew upon Gattshall et al.'s (2008) model of home environment influences on child Body Mass Index (BMI), which divides home environment influences into two categories, the food home environment and the physical activity (PA) home environment. Gattshall's (2008) model was used as it was the most comprehensive model at the time to highlight the relationships between the home environment and childhood BMI. This model divides each of the home food and the home PA environment into two sub-categories, the physical environment (the availability and accessibility of food/PA) as well as the social environment (parental modeling and policies around food/PA). This thesis examined these home environment influences, which have only recently been studied as a sum of factors in relationship to childhood diet, PA and obesity (Strauss & Knight, 1999; Gattshall, Shoup, Marshall, Crane, & Estabrooks, 2008; Tandon, et al., 2012). In addition to the food and PA home environment, this study also examined caregiver weight, smoking at home and the child's sleeping patterns, which have all been shown to have significant relationships with children's weight (NICE, 2006; Chen, Beydoun, & Wang, 2008; Davis, McGonagle, Schonei, & Stafford, 2008; Chiolero, Faeh, Paccaud, & Cornuz, 2008; Must & Parisi, 2009; Kwon, et al., 2010). These factors were all instrumental in the design of the theoretical model of this study (see Fig 3.1). This study is a pilot study with respect to this study's setting (Egypt).

In the past few years, several tools have been developed and tested as valid reliable tools to investigate the home environment with respect to children's PA and dietary habits (Bryant, et al., 2008; Gattshall, Shoup, Marshall, Crane, & Estabrooks, 2008; Johnson, Welk, Saint-Maurice, & Ihmels, 2012). The Healthy Home Survey (HHS), the tool adapted for this study, has examined the afore-mentioned home environment influences in a single survey

(Bryant, et al., 2008). The rationale behind the use of the HHS in this study is presented in section 2.8.8.3. The HHS included investigations of general area characteristics (proximity to recreation areas and gym facilities, presence of sidewalk, whether the street is busy), household health behaviours (smoking, gym memberships, diet, frequency of exercise), physical activities (active play, dancing) versus sedentary activities (light activity, watching TV, playing videogames, sleeping), food availability (availability of a variety of vegetables, fruit, salty and sweet foods), food accessibility (accessibility to vegetables, fruits, sweet snacks, salty snacks, candy and chocolates, soda), parental controls on children's eating (rewards and restriction), children's play behaviour and environment (yard presence, wheeled toy presence), media availability (TV, videogames, computers, video tapes) and media controls in the home (TV, computers and video games restriction/rewards).

Based on already existing research concerning the home environment, this study aimed to examine the relationship between several aspects of the home environment and obesity in urban Egyptian children aged 2-12 years. The study aimed at addressing four research questions:

1. **Are there significant relationships between various home environment aspects and childhood overweight/obesity in Cairo, Egypt?**

2. **Is there a difference between home environments among socio-economic variables (SES areas and income) in Cairo, Egypt?**

3. **What are the maternal perceptions of obesity, diet and PA in Egypt?**

4. **What are Egyptian children's diet and PA experiences and do these differ between SES areas?**

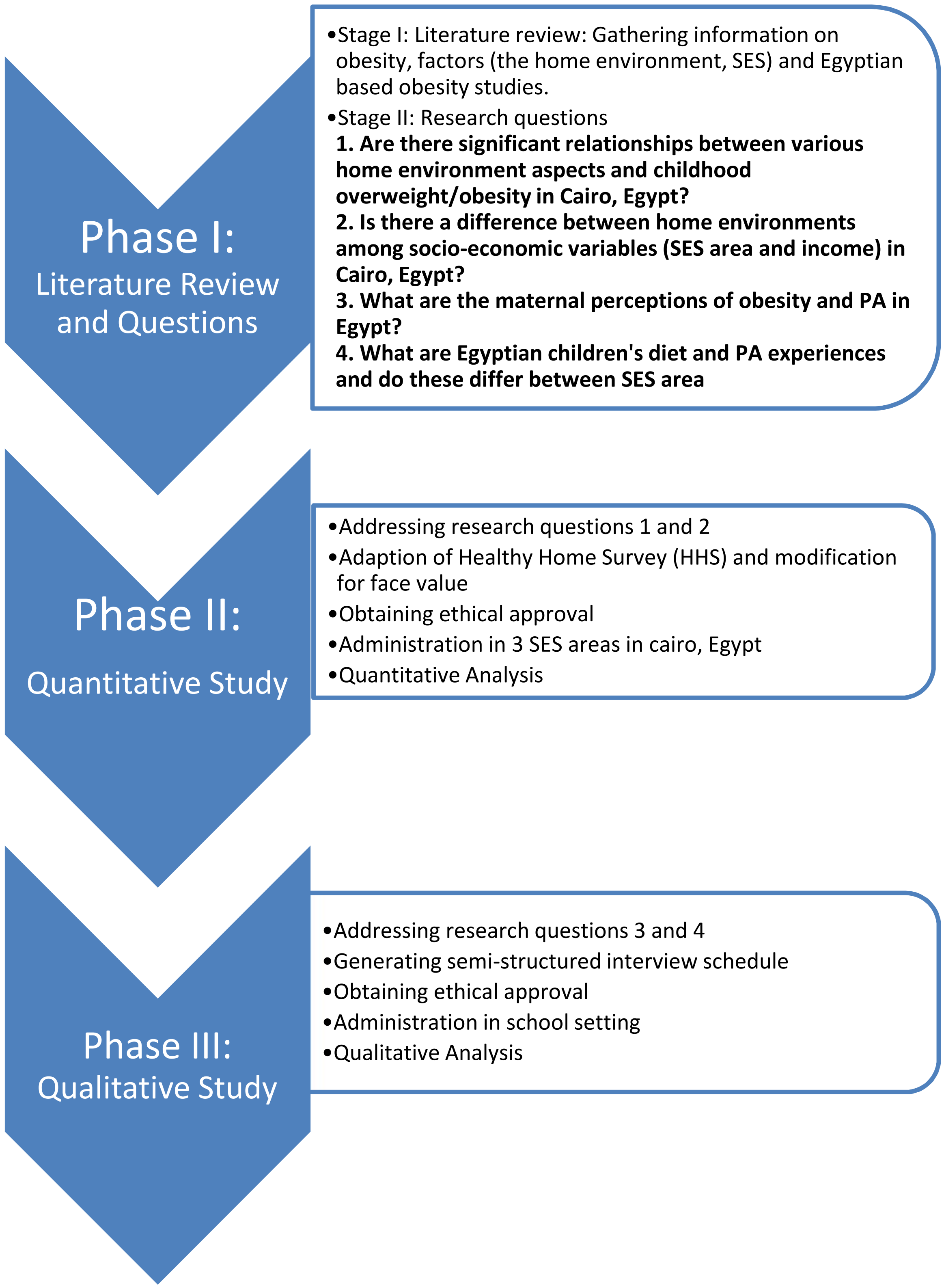
This study adapted Gattshall's (2008) model of home environment influences, incorporating all the factors investigated into a theoretical model (Fig 3.1). The study employed a mixed methods approach. The first two research questions were addressed through the initial quantitative phase using the HHS (Appendix A) as a research tool. The study aimed to compare the home environment between SES areas in Cairo. The HHS was therefore modified for face value in an Egyptian setting (Appendix B), and administered to 210 households onsite in three different SES areas in urban Cairo between February and April 2010. This number of households was chosen to allow the minimum number of participants required for between groups data analysis (minimum of 50 per group). Data gathered from this phase were subjected to quantitative analysis by using SPSS.

The second qualitative phase (November 2011) addressed questions 3 and 4 of the aims, and involved taking anthropometric measurements of caregivers who participated, as well as carrying out recorded semi-structured interviews (Appendix C) with 17 mothers. These semi-structured interviews investigated household diets and exercise, as well as mothers' perceptions of obesity (whether they perceived themselves and their children as obese, reasons for obesity, at risk groups) and PA (whether PA was more important than diet in health, whether they were satisfied with their child's PA). Initially, a random selection of households in the same SES areas (similar to the quantitative phase) was planned, but due to the political turmoil and security instability in Egypt during the second phase (particularly security in lower SES areas), the methodology used in the first phase was not feasible. Therefore, mothers from various SES areas working in an international school in Cairo (cleaners, administration, and teachers) were interviewed, with permission from the school's owner (Appendix F). Data collected were transcribed and subjected to thematic analysis.

1.1 Study Framework

This study's framework (see Fig. 1.1) was divided into three phases. Phase I consisted of a literature review to identify the study's research questions. Phase II included the administration and analysis of the quantitative study, which employed the HHS and was administered in spring 2010. Phase III involved the collection and analysis of the supplementary qualitative data, which investigated the cultural environment (the urban Egyptian setting) and aimed at informing results of the quantitative survey.

Figure 1.1. Study framework



1.2 Outline of Thesis Chapters

Chapter Two highlights Phase I of the study: the literature review, which led to the research questions. The chapter begins with an overview of obesity, its detrimental effects on the individual and society, and its worldwide prevalence in both adults and children. Overweight and obesity in Egypt is covered extensively. The chapter also covers the SEM and Gattshall's model of home environment influences on child BMI, and presents an in-depth investigation of the relationships between various home environment influences and childhood obesity. Finally, the chapter examines the cultural setting in which this study is based (urban Egypt), and covers various relevant topics to the study (the urban SES make up of Cairo, the family unit, and dietary habits).

Chapter Three is a description of the study design. This chapter outlines the theoretical model generated for this study, and describes the use of mixed methods.

Chapter Four is a critical analysis of Phase II: the quantitative phase. It describes in detail the implementation of the quantitative study in spring 2010. The rationale behind this study is described, and the adoption, modification and distribution of the HHS is covered in detail. The chapter then displays the results of the quantitative dataset, including both descriptive data and results of the various statistical analyses employed to determine significant relationships between variables investigated. Finally, a discussion of the quantitative findings is presented.

Chapter Five is a critical analysis and description of the entire Phase III: the qualitative study, which was administered in autumn 2011. This chapter describes in detail the study's rationale, design, methodology, implementation and analysis. This chapter also presents the content analysis of the transcribed data from this phase's semi-structured interviews, followed by a discussion of the emergent themes.

Chapter Six is the discussion of the whole study. It presents the key findings of both quantitative and qualitative studies, linking them to one another and discussing them in relation to and to the theoretical framework of the study. It provides a general outlook on the home environment in an Egyptian setting. This chapter also presents the limitations and recommendations for research, policy and practice.

Chapter 2 Phase I An Examination of Environmental Influences On Obesity and the Egyptian Cultural Context

2.1 Chapter Overview

The literature review first defines obesity, how it is measured and its potential negative impacts on the individual and on society. Prevalence worldwide is then reviewed, including global adult and child prevalence in both developed and developing countries. Obesity prevalence in Egypt (the study setting) is then covered. Following this is a critical discussion of the SEM (Stokols, 1996; Robinson, 2008) with respect to obesity factors (Foresight, 2007; Gattshall, Shoup, Marshall, Crane, & Estabrooks, 2008). The home environment is then reviewed in detail, whilst presenting and adhering to Gattshall's (2008) SEM based model of the home environment determinants on child BMI. This is followed by a review of tools used to measure the home environment comprehensively, including the HHS survey adapted (Bryant, et al., 2008) in this study. The penultimate section is an examination of the cultural setting in which this study was based: Cairo, Egypt. The aspects covered in the Egyptian section include Egypt's economic standing, urban ecology, family structure, dietary habits and physical activity (PA). The final section presents the rationale and aims of the study.

2.1.1 Search Strategy for the Literature Review

The literature review search commenced in 2008 and was ongoing throughout the study. Search engines used included the University of Salford's SOLAR search engine, and online databases used included Science Direct and PubMed. Topics investigated included the SEM (Stokols, 1996; Robinson, 2008) and its relation to obesity, food choice and PA. The home environment and its' impact on obesity have been researched online extensively, including tools used to measure the home environment. Correlations between SES and obesity in developed and developing countries were also researched extensively. Social and cultural development in Egypt were thoroughly researched, including dietary changes/trends, urbanisation and other social factors that relate to diet and to obesity (Galal, 2002; Sims, Sejoume, & El Shorbagi, 2003; Hassan-Wassef, 2004; Denis, 2006). This was done through online database searches for papers on obesity in Egypt. Sources were also obtained through liaising with the health research agency which aided this study, El Zanaty & Associates, as well as literary sources from the American University in Cairo's library. Websites with data relating to obesity were also frequently visited for updates, including the National Obesity Observatory (NOO), National Institute of Care and Health Excellence (NICE), World Health Organisation (WHO) and the International Association for the Study of Obesity (IASO).

2.2 Definition and Measurement of Obesity

Obesity is defined by the National Health Service (NHS) (2010) as the condition whereby a person carries too much fat for his/her height and sex. Obesity is most commonly measured by Body Mass Index (BMI), a persons' weight in kilograms divided by their height in metres squared. According to the NHS (2012), overweight adults' BMI equals or exceeds 25kg/m^2, and obese adults' BMI equals or exceeds 30 kg/m^2.

The NOO (2010) states that BMI measurements for children vary by age and sex; therefore growth reference charts are used when measuring childhood obesity. This is done through the derivation of BMI Z-scores, measures of weight adjusted for age and sex and calculated to an external reference (a national or international scale such as the UK and US growth charts) (Must & Enderson, 2006). The Centers for Disease Control and Prevention (CDC) (2012) recommends BMI as a simple, non-invasive anthropometric measure that has shown to be correlated with future health risks. However, BMI measures excess weight rather than body fat – the measure does not differentiate muscle mass, bone mass or excess fat – and does not take into account that the BMI/excess fat relationship varies with age, ethnicity, gender and muscle mass (CDC, 2012). BMI measurement in children presents similar considerations, with the additional factors of height and level of sexual maturation (which both influence the BMI/body fat relationship), and BMI has been shown to be a good indicator of body fat among obese children (≥95th percentile) but not among at risk (between 85th- 94th percentile) or healthy weight children (5th - 85th percentile) (Freedman & Sherry, 2009; CDC, 2012). Other measurements of obesity include skin fold thickness using calipers, measures of bio-impedance (opposition to electrical current flowing through muscle and lean tissue fluids), and waist circumference (cm)/waist-to-hip ratio (NOO, 2010) to measure central adiposity (body fat that is centrally localised) (Goldbacher, Matthews, & Salomon, 2005). Central adiposity is an important measure of obesity, as it has been shown to be associated with cardiovascular risk factors, chronic disease risk and blood pressure reactivity, especially in adolescents and children (Goldbacher, Matthews, & Salomon, 2005; Lawlor, et al., 2010; Tybor, Lichtenstein, Dallal, Daniels, & Must, 2010). A more recent measurement of adiposity, Waist to Height Ratio (WtHR), has also been shown to be an effective predictor of cardio-metabolic risk regardless of age, gender or ethnicity (Ashwell & Hsieh, 2005; Browning, Hsieh, & Ashwell, 2010; Graves, et al., 2013). Further critical discussion of anthropometric measures (including those used in this study), can be found in Section 4.6.2.

2.3 The Impact of Obesity on Health & Society

2.3.1 Impact of Obesity on the Individual

Overweight and obesity result in higher morbidity and mortality rates associated with resultant conditions such as cardiovascular disease (CVD), Type-2 diabetes, as well as certain cancers (Ball & Mishra, 2006; NOO, 2013). According to the Department of Health (DH), obesity has many adverse effects on health, raising the risk of acquiring Type II diabetes by 20 times in those with a BMI over 30, raising the risk of Coronary Heart Disease (CHD) 3.6 times, and consequently lowering life expectancy by 11 years (2011). Moreover, Type II diabetes which was previously regarded as an adult illness has risen in prevalence in overweight children from age 5 upwards globally (NOO, 2013). Furthermore, children have a high risk of retaining obesity into adulthood, and are at risk of a variety of physical and psychological complications such as early puberty, eating disorder prevalence, asthma, skin problems, low self esteem, feelings of shame and depression and also increases exposure to incidences of bullying (Dietz, 1998; Janssen, Craig, Boyce, & Pickett, 2004; Sjoberg, Nilsson, & Leppert, 2005; Lee, et al., 2007; Lumeng, 2008; NOO, 2013).

2.3.2 Impact of Obesity on Society

The effect of obesity extends far beyond personal health, affecting the well-being of society as a whole. This includes economic growth; in the UK, the estimated annual direct cost of overweight and obesity on the National Health Service (NHS) was £5.1 billion, the cost of overweight problems to the wider economy was estimated at £16 billion, and could be as high as £50 billion in 2050 if unchecked (Foresight, 2007; DH, 2012). Furthermore, the NOO's (2011) publication, the Economic Cost of Obesity, predicted the indirect cost of obesity in the UK to be £27 billion in 2015. Also, related morbidities such as Type II diabetes also have an adverse impact on the economy; NHS spending on insulin – the drug used to treat diabetes - has increased by 130% (from £156 million to £359 million per annum from 2000-2009) (Holden, Poole, Morgan, & Currie, 2011) and according to the NHS (2011), diabetes prescriptions made up 8.4% of the total NHS prescription bill in 2010/11. Data on the cost of obesity to the Egyptian government is not available.

Obesity also affects a country's economy through productivity. Recent research in developed countries has demonstrated an inverse relationship between levels of productivity and increase in BMI in the working population (Gates, Succop, Brehm, Gillespie, & Sommers, 2008; Tsai, Ahmed, Wendt, Bhojani, & Donnelly, 2008; NOO, 2011). Tsai et.al's (2008) study demonstrated that obese employees were 80% more likely to be absent, and were absent 3.7 more days per annum than healthy weight employees. Gates et al.'s (2008) study of workers at various Kentucky manufacturing plants revealed workers with a BMI of 35 or above had the greatest limitations in the time taken to complete tasks and the ability to perform physical job demands. Their loss of productivity was 1.18% more than other employees and cost their companies an additional $506 in lost productivity per worker per annum.

The NOO (2011) estimated the indirect costs of obesity (through loss of productivity) on the UK to be between £2.6 billion and £15.8 billion. Furthermore, the Obesity Risk Index (ORI) (Maplecroft, 2013), which assessed the negative impact of obesity on the productivity of workforces in 188 countries, revealed that both developed and developing countries are at risk of decreased productivity, including Egypt - which had the 4th highest risk among all countries.

2.4 Worldwide Prevalence of Obesity in Adults

Obesity and overweight are very much a global issue, according to reports documenting the global increasing rates of obesity (WHO, 2010; IASO, 2012). The WHO in 2012 reported a global obesity prevalence of at least 200 million men and 300 million women. The UK's NOO compilation of adult (over 16 years old) obesity from the Health Survey for England (HSE) (2009-11) data reported prevalence of overweight and obesity in men were 42.2% and 24%, respectively, and 32.3% and 25.3% in women, respectively (2012). Obesity prevalence in US adults was 33.8% in 2008 (NOO, 2013), and prevalence in the WHO European Region countries has tripled since the 1980's (WHO Europe, 2013). Moreover, reports from many developing countries (countries in South America, the Middle East, and Asian countries) have shown an increased prevalence of overweight and obesity in their adult populations (Pena & Baccalao, 2000; Afridi & Khan, 2004; Measure DHS, 2009; IASO, 2012).

Table 2.1. Worldwide estimated obesity (BMI ≥ 30 kg/m²) prevalence, males 15+, 2010 (WHO Global Infobase, 2010).

Country	Obesity prevalence (%) in males aged 15+	Rank (out of 129 member countries)
Nauru	84.6	1
Cook Islands	72.1	2
Micronesia, Federated States of	69.1	3
Tonga	64.0	4
United States	44.2	5
Samoa	42.2	6
Niue	40.7	7
Argentina	37.4	8
Palau	35.0	9
Kiribati	33.6	10
Kuwait	29.6	13
United Arab Emirates	24.5	21
United Kingdom	23.7	23
Saudi Arabia	23.0	25
Egypt	22.0	27

The latest WHO (2010) global obesity data (BMI 30 and over) and league tables (Tables 2.1 & 2.2) compared obesity prevalence in adult males and females aged 15 and above. Table 2.1 shows the highest prevalence of adult male obesity (BMI ≥ 30 kg/m²) in the West Pacific Region (WPR), with Nauru, Cook Islands, Micronesia, Tonga, Samoa, Niue, Palau and Kiribati among the top ten positions in the league tables. The only two non-WPR countries in the top ten ranking countries were the United States and Argentina (5th and 8th respectively). Although Middle Eastern Region (MER) countries were not among the top ten ranking countries in obesity prevalence, they ranked highly. Kuwait ranked the highest among MER countries (13th), followed by the United Arab Emirates (21st), Saudi Arabia (25th) and Egypt (27th) (WHO, 2010).

Table 2.2. Worldwide estimated obesity (BMI ≥ 30 kg/m²) prevalence, females 15+, 2010 (WHO Global Infobase, 2010).

Country	**Obesity prevalence (%)** in females aged 15+	Rank (out of 129 member states)
Nauru	80.5	1
Tonga	78.1	2
Micronesia, Federated States of	75.3	3
Cook Islands	73.4	4
Niue	64.7	5
Samoa	60.9	6
Palau	59.4	7
Barbados	57.2	8
Kuwait	55.2	9
Trinidad and Tobago	52.7	10
United States	48.3	13
Egypt	48.0	14
United Arab Emirates	42.0	17
United Kingdom	26.3	56

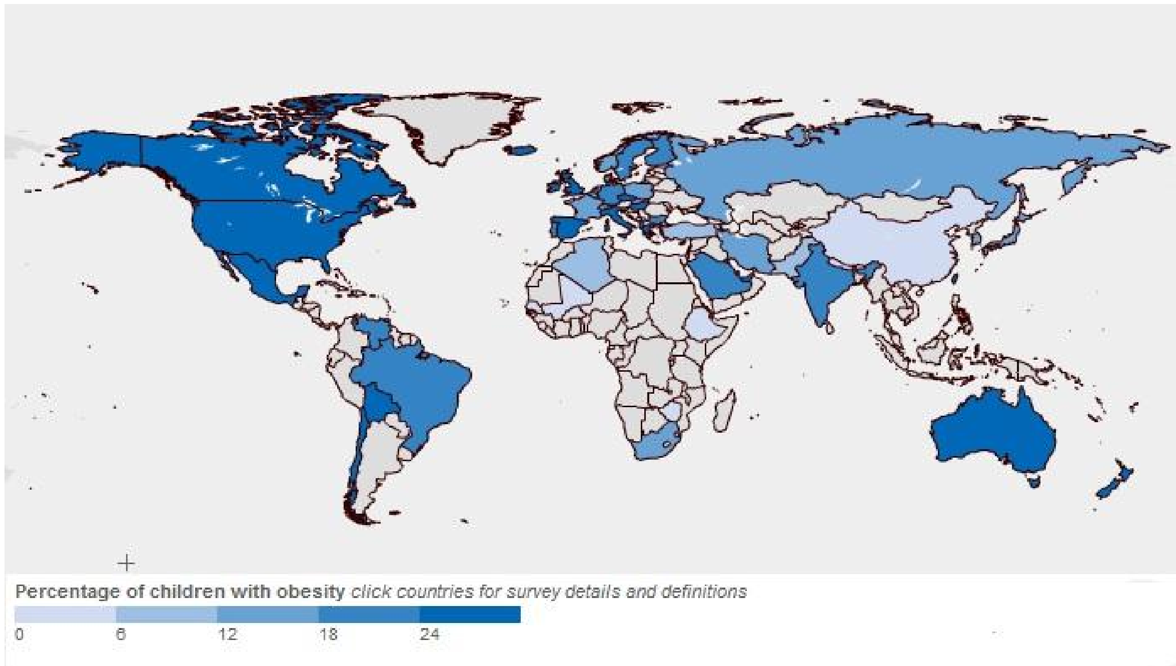
With regards to females' (15 years and older) obesity prevalence (Table 2.2), a large number of WPR countries were among the top 10 countries with regards to adult female obesity, with Nauru, Tonga, Micronesia, Cook Islands, Niue, Samoa and Palao occupying the top seven positions. MER countries also ranked highly in female obesity prevalence, Kuwait again exhibiting the highest prevalence in the region (ranking 9th) followed by Egypt (14th) and the United Arab Emirates (17th). A detailed description of adult obesity prevalence in Egypt is presented in section 2.7.

The WHO's (2010) global obesity league tables revealed that adult obesity is a global issue. It is high in developed countries, and alarmingly prevalent in many middle income countries (Middle Eastern and South & Central American countries), but remains low in countries suffering from poverty and instability (parts of S.E. Asia and Sub-Saharan Africa) (WHO, 2010). However, within the top thirty countries with obesity prevalence are those classified by the World Bank as high income (a Gross National Income (GNI) of $12,616 or more – like Kuwait) (2012) and low middle income (a GNI of $1036 - $4085 like Egypt) (2013). This is worth investigating, to try and understand why such high rates exist in these developing countries which vary in wealth, and to try to ultimately tackle prevalence.

2.5 Worldwide Prevalence of Obesity in Children

Childhood obesity prevalence has been examined alongside adult prevalence on a global scale. In 2010, it was estimated that 43 million children aged under 5 worldwide were overweight or obese, 92 million were at a risk of overweight and that 75% of the 43 million overweight/obese children were from low/middle income countries (de Onis, Blössner, & Borghi, 2010; Low, 2010). The IASO's (2012) latest global childhood overweight and obesity figures (see Fig 2.1) showed that although prevalence was highest in developed countries, prevalence was quite high in developing countries as well. Furthermore, studies over the last two decades in both developing and developed countries have identified childhood obesity as a worldwide problem (Wang & Lobstein, 2006; Han, Lawlor, & Kimm, 2010; IASO, 2012; Skouteris, et al., 2012). In the MER, studies have also revealed overweight/obesity as a childhood/adolescent issue (Musaiger, et al., 2012; Aljunaibi, Abdulle, Sabri, Hag-Ali, & Nagelkerke, 2013). Musaiger et al.'s cross-cultural study (2012) examined seven Arab countries (Algeria, Jordan, Kuwait, Libya, Palestine, Syria, and the United Arab Emirates) reporting that male overweight prevalence was highest in Kuwaiti (25.6%), Jordanian (21.6%), and Syrian (19.7%) adolescents, while female overweight prevalence was highest in Libyan (26.6%), Kuwaiti (20.8%), and Syrian (19.7%) adolescents. Kuwaiti adolescents showed the highest obesity prevalence of both males (34.8%) and females (20.6%). Obesity prevalence in Egyptian children and adolescents is discussed in detail in Section 2.7.

Figure 2.1. Childhood obesity worldwide prevalence (IASO, 2010)



IASO data (2012) regarding childhood overweight/obesity prevalence (as seen in figure 2.1) revealed that prevalence was highest in the US (35.1% of boys and 36% of girls aged 6-17 were overweight/obese in 2003/4). In England, 22.7% of boys and 26.6% of girls aged 5-17 years were overweight/obese. High overweight and obesity prevalence was also found in many developing regions of the world, including the MER countries (in Kuwait, 30% of boys and 31.8% of girls aged 10-14 were overweight in 1999/2000) (IASO, 2012). Data on obesity in Egypt was missing from figure 2.1, but is reviewed in detail in section 2.7.2.

Childhood obesity could result in children's life expectancies being shorter than those of their parents and grandparents due to associated health related risks such as diabetes, adult obesity, premature mortality, raised cholesterol and fatty changes to arterial linings (Daniels, 2006; Hills, King, & Armstrong, 2007; Stewart, Cutler, & Rosen, 2009; NOO, 2013). Studies have demonstrated the strong link between childhood weight status and adulthood weight status - once obesity is present in childhood, it will likely to continue into adulthood (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997; Lumeng, 2008). Obesity and overweight in childhood could lead to an increased risk of cardiac events in adulthood, illnesses of most organ systems, and an increased risk of co-morbidities such as hypertension, pulmonary disorders and non-alcohol liver disease (Low, 2010). Moreover, obesity results in a reduction in self-esteem and quality of life (socially) (Griffiths, Parsons, & Hill, 2010).

2.6 Prevalence Trends in Developed and Developing Countries

The trend in developed countries (UK, US) is that overweight and obesity risk is highest among people of low SES (measured by education, income and occupation) (Song, 2006; McLaren, 2007; OECD, 2012; Drewnowski, et al., 2013; Nogueira, et al., 2013). The NOO's (2010) document on SES and obesity found that SES was negatively correlated with occupation-based and qualification-based measures in men, and that SES was inversely correlated with women's obesity regardless of measure. There is an observed socio-economic gradient in diet in developed countries, whereby higher SES groups can afford healthier foods and thus have healthier diets including high consumption of vegetables, fruit and low consumption of fats (Travers, Cogdon, & McDonald, 1997; Drewnowski & Darmon, 2005; Power, 2005; Wilson, 2013).

Similar associations between SES and obesity were observed with respect to prevalence in adults and children in developed countries. Obesity is more prevalent in children and adolescents of lower SES, but the magnitude in differences is limited (compared to differences within ethnic minorities in the US for example), whereas studies and reviews of developing countries found a higher obesity prevalence in higher SES children (Reilly, 2005; Dinsa, Goryakin, Fumagalli, & Suhrcke, 2012; Gupta, Goel, Shah, & Misra, 2012). A study by Murasko (2009), using data from the US 1999-2006 National Health and Nutrition Examination Surveys (NHANES), examined the poverty-income ratio (PIR), defined by the US Census Bureau (2011) as an inflation-adjusted ratio of a family's income relative to poverty thresholds for family size (the higher the PIR the higher the income). Results showed that PIR was negatively correlated to BMI in both males and females. The NOO (2012) states that in the UK, results from the National Child Measurement Programme and the Health Survey for England showed an inverse almost-linear relationship existed between Index of Multiple Deprivation (IMD) 2010 area score and obesity prevalence. According to the NOO (2012), child obesity prevalence in the lowest tenth of local areas was almost double the prevalence in the highest tenth; these findings were consistent when the Income Deprivation Affecting Children Index and occupation based social class were used as measures.

Associations between level of education, employment and area level (all of which are components of SES) affect obesity prevalence in the following ways. The attainment of education/qualifications leads to greater recognition and perception of both health advice/promotion and societal attractiveness standards, and also to higher drive for personal achievement (health, weight) which may manifest itself through body dissatisfaction (Bourdieu, 1985; Power, 1999; McLaren & Kuh, 2004; McLaren, 2007; von Lengerke, Mielck, & KORAStudyGroup, 2012). Negative associations between area level (by postcode deprivation) and obesity have been noted in numerous studies where higher SES areas have easier access to healthy food, more opportunities for PA and a higher pressure to conform to the thin ideal (McLaren & Gauvin, 2002; Morland, Wing, Roux, & al., 2002; McLaren & Gauvin, 2003; Baker, Schootman, Barnidge, & Kelly, 2006; Giles-Corti, 2006). This is an example of Bourdieu's (1985) concept of 'habitus', whereby people embody their social structures or 'capital' (made up of cultural, economic and social variables) through appearance and behaviour. In high SES cultures, the thinness ideal among women - more financially attainable to higher SES women - is an example, and leads to class separations among them (Groesz, Levine, & Murnen, 2002). With respect to occupational differences, higher level occupations may both stigmatise overweight and obesity, and my also provide facilities to encourage exercise and healthy living, which in turn leads to employees internalising and practising a healthy lifestyle (Puhl & Brownell, 2001). In men, there exist less significant associations between body size and SES variables (education showed a negative association, while income was often positively associated with body size), which may relate to Bourdieu's 'habitus' concept in the sense that men and women have different ideal body images (thin for women and large/muscular for men) (McVey, Tweed, & Blackmore, 2005; McLaren, 2007).

Prior to 1989, obesity was considered to be related to high income countries, but more recently, it is on the rise in low and middle income populations (Monteiro, 2000; WHO, 2012). In low and middle income countries (including Egypt), positive associations were found between women's body size in particular and SES (Sobal & Stunkard, 1989; Monteiro, Moura, Conde, & Popkin, 2004; El-Zanaty & Way, 2009). In lower income cultures, people of low SES engage in high levels of PA and energy expenditure, so larger body size is valued within these cultures (Monteiro, Moura, Conde, & Popkin, 2004; Song, 2006). Moreover, Monteiro et al.'s (2004) review of studies of developing countries published between 1989 and 2003 revealed that low and middle income countries experiencing a growth of gross national product (GNP) are shifting towards greater negative associations between SES and body size, which affects women at an earlier stage than men. Men in middle income countries also exhibited less significant associations between SES variables and body size than women (Sobal & Stunkard, 1989; McLaren, 2007). However, recent data regarding women's weight from 39 low-income countries indicate higher overweight prevalence in higher wealth and education groups (Jones-Smith, Gordon-Larsen, Siddiqi, & Popkin, 2012). Song (2006) also states that economic development in developing countries results in a transient stage whereby people of a high SES are more prone to overweight and obesity. Dinsa et al.'s (2012) systematic review of obesity in low and middle income countries (per capita of $12,275 or less) further illustrates this by finding a significant association between high SES, education and obesity prevalence in both men and women. These trends may further change as a developing country's GDP further increases, with a fast growth rate of overweight prevalence among lowest wealth and education groups (Jones-Smith, Gordon-Larsen, Siddiqi, & Popkin, 2012). These changes are due to several factors, mainly the urbanisation, modernisation and globalisation processes in developing countries, and the dissipation of factors that once shielded the poor from obesity (Hawkes, 2006; Song, 2006; El-Zanaty & Way, 2009).

A rise in obesity prevalence in children in developing countries was also reported in a review of worldwide studies (Gupta, Goel, Shah, & Misra, 2012), which stated that prevalence was rising in children (aged 5-19) in Mexico, Brazil, India, Thailand and Argentina. The study also reported that in those countries, significant factors affecting an increase in childhood obesity included high SES, living in metropolitan areas, being female, unawareness about nutrition, poor PA facilities and increasing academic stress. Additionally, a systematic review of fifteen studies on childhood weight in developing Asian countries (Yang, Williams, Collins, & Chee, 2012) revealed that prevalence ranged from 5.1% to 19.9% and that dietary patterns - low fruit and vegetable intake, high meat and fast food consumption, and eating out - were significantly related to higher childhood overweight/obesity. Wang and Lim (2012) also found that worldwide prevalence of childhood obesity increased between 1990 and 2010, reporting associations between obesity prevalence and access to energy dense diets (low SES in developed countries and high SES in developing countries).

2.7 Obesity Prevalence in Egypt, a Developing Country

2.7.1 Obesity Prevalence in Egyptian Adults

According to the WHO's (2010) worldwide overweight and obesity data and league charts, Egypt ranks 29th out of 192 countries in highest overweight and obesity prevalence (BMI ≥ 25 kg/m²) in adult males (64.5%), and ranks 18th in highest overweight/obesity prevalence (BMI ≥ 25 kg/m²) in adult females (76%) (WHO, 2010). More recently, the Central Intelligence Agency (CIA) World Factbook (2012) reported Egypt as having the 8th highest obesity prevalence worldwide (a rate of 30.30), and the FAO's (2013) 'The State of Food and Agriculture' reported that Egypt suffers from a combination of adult obesity, child stunting and child macronutrient deficiencies. These figures are alarming, as they place Egypt as the fattest nation in Africa, and among the top three fattest countries in the MER.

Both the most recent Egypt Demographic Health Survey (EDHS) report (El-Zanaty & Way, 2009) and the WHO (2010) highlighted the high prevalence of women's obesity – according to the EDHS, 39.6% of women aged 15-59 were obese while the WHO reported 48% of women aged 15+ were obese (over 30 kg/m²) in 2010. Moreover, an increase of mean BMI among mothers (aged 18-49) with young children increased from 26.9 kg/m² in 1992 to 30.1 kg/m² in 2005 (Nahmias, 2007). The increased incidence in women may be due to women's home based roles in Egyptian society and perhaps religious and cultural restrictions which prevent a greater amount of PA (Aldinger & Bauernfeind, 2001; Auter, Agnihotri, Reda, Sharif, & Roy, 2009; Badran & Laher, 2011).

Data showed a positive correlation between age and BMI (Ibrahim, ND; El-Zanaty & Way, 2009). Data also revealed a positive correlation between age and waist circumference (cm) in Egyptian women - the mean age for women with the lowest waist circumference (WC) (less than 70 cm) was 37.4 years, while the mean age of women with the highest WC (more than 109 cm) was 45 years (Ibrahim, ND). EDHS results showed an increase in obesity prevalence with age in both men and women; obesity prevalence rose from 10% in women aged 15-19 to 65% or more in women aged 45-59 and rose from 6% in men aged 15-19 to 33% in men aged 55-59 (El-Zanaty & Way, 2009).

Obesity is especially prevalent in Lower Egypt – the Delta region where Egypt's main urban areas lie (Aboulfotouh, Soliman, Mansour, Farghaly, & El Dawaiaty, 2008; El-Zanaty & Way, 2009). Aboulfotouh et al.'s (2008) study revealed that governorates (the equivalent of English counties) in Lower Egypt had a much higher prevalence of abdominal obesity in Egyptian adults (aged 18+) than in Upper Egypt, and that overall prevalence of central obesity was 24.1% (measured using WC) and 28.7% (measured using Waist to Hip Ratio (WHR)). Aboulfotouh et al.'s study reported the sample's mean BMI to be 28.1 kg/m^2 (2008). The EDHS reported similar results, stating that urban men and women were more likely to be classified as obese than their rural counterparts; prevalence of obesity in urban and rural men (aged 15-59) was 22% and 15% respectively, and 49% and 25% in urban and rural women (aged 15-59) respectively (El-Zanaty & Way, 2009).

The relationship between obesity and SES in Egyptian adults has also been documented recently, with often conflicting findings. The EDHS reported that among men, obesity prevalence in the highest two wealth quintiles (measured by household assets) were 24.8% and 23.9% compared to 8.6% in the lowest quintile (El-Zanaty & Way, 2009). Ibrahim's (2009) study of SES (by household assets) also found a positive association between obesity and SES in both normotensive and hypertensive men and women, noting an increase in BMI from low to high SES groups. Although the 2008 EDHS stated that women in the highest wealth quintile were twice as likely as the lowest quintile to be obese on a national scale, examination of EDHS reports from 1995-2008 reports displayed a significant negative correlation in obesity trends among urban Egyptian mothers (aged 18-49 years) by educational status – which in Egypt closely linked with SES (Aitsi-Selmi, et al., 2012). Aitsi-Selmi et al. (2012) found the largest increase in obesity prevalence among women with no/primary education as opposed to those with secondary education. Mowafi et al.'s (2011) investigation of the association between area level education and BMI among adults in Egypt further confirmed the inverse relationship between area level education and adult BMI. In addition, Aitsi-Selmi et al. (2011) also found an especially high prevalence of obesity among lower socio-economic groups with rising incomes and little/no education.

2.7.2 Obesity Prevalence in Egyptian Children and Adolescents

Obesity studies on Egyptian children use US based percentile growth charts when examining overweight/obesity because cut-off points for childhood obesity have not yet been investigated or drawn locally (El-Masry & Hassan, 2010). Recently, the WHO (2012) have developed growth percentile curves for obesity to be used globally, based on their Multicentre Growth Reference Study (MGRS) undertaken from 1997 to 2003 investigating children worldwide, incorporating percentiles and Z-scores as BMI for age indicators for children up to 5 years of age. Although the WHO percentiles and Z-scores may not be ideally representative of Egypt's own growth curves, they are used in studies as a template to compare scores with other regions.

Obesity and overweight were prevalent among Egyptian children and adolescents according to the few studies carried out in the past decade. Among Egyptian preschool children (12-60 months), prevalence of obesity and overweight were 7.5% and over 20% respectively according to WHO reference curves (Martorell, Khan, Hughes, & Grummer-Strawn, 2000). A large national sample of Egyptian adolescents found Egyptian boys to be thinner than the WHO/National Centre for Health Statistics reference population at the 95th percentile, and Egyptian girls to have a heavier 50th percentile than the reference population, both genders exhibiting similar 5th and 95th percentiles (Galal, 2002).

Table 2.3. EDHS overweight prevalence in Egyptian adolescents (2009)

Age of adolescent	Girls overweight prevalence (BMI)		Boys overweight prevalence (BMI)	
	At risk of overweight (85th to < 95th percentile)	Overweight (≥ 95th percentile)	At risk of overweight (85th to < 95th percentile)	Overweight (≥ 95th percentile)
10-11 years	15.4%	5.3%	14.4%	7.1%
12-13 years	17.8%	6.6%	16.3%	5.4%
14-15 years	21.8%	6.5%	18.4%	3.5%
16-17 years	21.5%	6.7%	13.9%	4%
18-19 years	20.9%	4.3%	10.6%	3.4%

Table 2.3 presents the latest national data on Egyptian adolescent overweight prevalence by the EDHS in 2008, which classified youth into various categories based on their BMI (based on the American CDC Growth Charts); underweight (under 5th percentile), healthy weight (5th - 85th percentile), at risk of overweight (85th - 95th percentile) and overweight (95th percentile and above). Prevalence of at risk and overweight in most age groups is higher in girls than in boys.

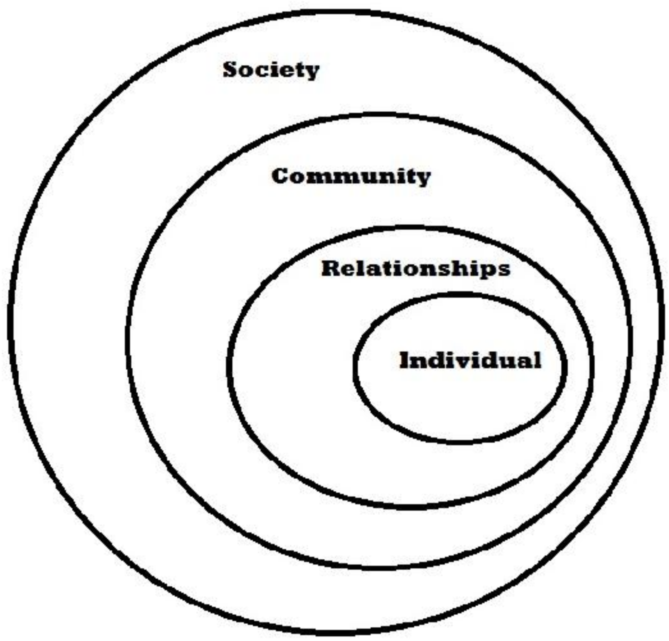
Urbanisation seemed to play a part in obesity prevalence in children and adolescents as it did among Egyptian adults (Jackson, Rashed, & Saad-Eldin, 2003; Salazar-Martinez, et al., 2006; El Zanaty, Ismail, & Abdel Rahman, 2010). Jackson et al.'s (2003) study of 340 Egyptian adolescent schoolgirls' BMI (also using CDC BMI growth reference curves) in both rural and urban Egypt revealed higher obesity prevalence in higher SES urban girls. The EDHS also reported the proportions of both urban male and female adolescents to be higher in both the overweight and at risk of overweight categories than their rural counterparts (El-Zanaty & Way, 2009). Although socio-economic differences in obesity prevalence among young Egyptians were rarely studied, the 2008 EDHS revealed a positive association between wealth quintile (measured by household assets) in both adolescent boys' and girls' BMI, as well as a positive relationship between adolescents' BMI and their mother's education status among both genders (El-Zanaty & Way, 2009). A recent study of overweight/obesity (El Derwi, El Shirbiny, & Atta, 2011) among 990 schoolchildren across three different schools in Fayoum (a rural governorate in Upper Egypt) using the CDC BMI percentiles showed that 34.2% of children were overweight/obese (particularly girls, 39% of which were overweight/obese), indicating that rural areas in Egypt might be catching up in terms of rise in overweight/obesity prevalence.

2.8 The Home Environment

2.8.1 Theoretical Basis: The Socio-Ecological Model of Health and its application to Obesity

The theoretical basis of this study is the SEM of health. This model derives from the field of social ecology which focuses on social, cultural and institutional aspects of human-environment interactions (Stokols, 1996). The SEM, according to Robinson (2001), is a comprehensive model used to address complex public health issues by examining various levels of influence which, together, lead to an emergence of a public health issue**.** The SEM has been used to address public health issues (such as obesity) (Cassel, 2010; Williams, 2011) which result from the interactions between biological and societal/environmental factors (Foresight, 2007). The SEM is therefore a suitable model as it classifies environmental settings as composed of multiple aspects (eg. social, emotional, physical) that influence outcomes, also taking into consideration personal attributes (genetic, behavioral) (Stokols, 1996; Victorian Curriculum & Assessment Authority, 2011). The main limitation of the SEM is that it is complex and takes into account various levels of influence, which may not allow the focus on a certain variable with respect to influences of obesity (Stokols, 1996). Another limitation might be the lack of variation within levels of influence – for example, when looking at PA influences, a certain city may have few people who value PA, coupled with limited support for walking and cycling and little PA opportunities in the physical environment (Sallis, Owen, & Fisher, 2008). Since this study is a pilot study in an Egyptian setting, it is important to identify various levels of influence to address and better understand obesity in Egypt.

Figure 2.2. The socio-ecological model (SEM) adapted from the CDC (2009)



The various levels of influence (seen in Fig 2.2) include the individual level (individual characteristics, knowledge, attitudes), relationships (influence of friends and family), community level (social network and norms) and societal level (public policy, local and state laws) (Robinson, 2008).

Figure 2.3. The SEM model of obesity factors (Foresight, 2007)

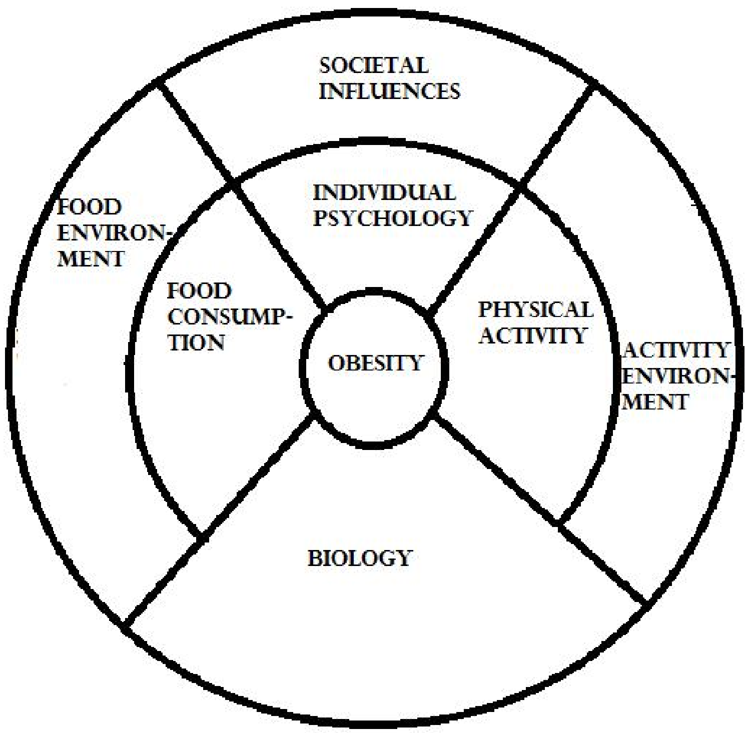
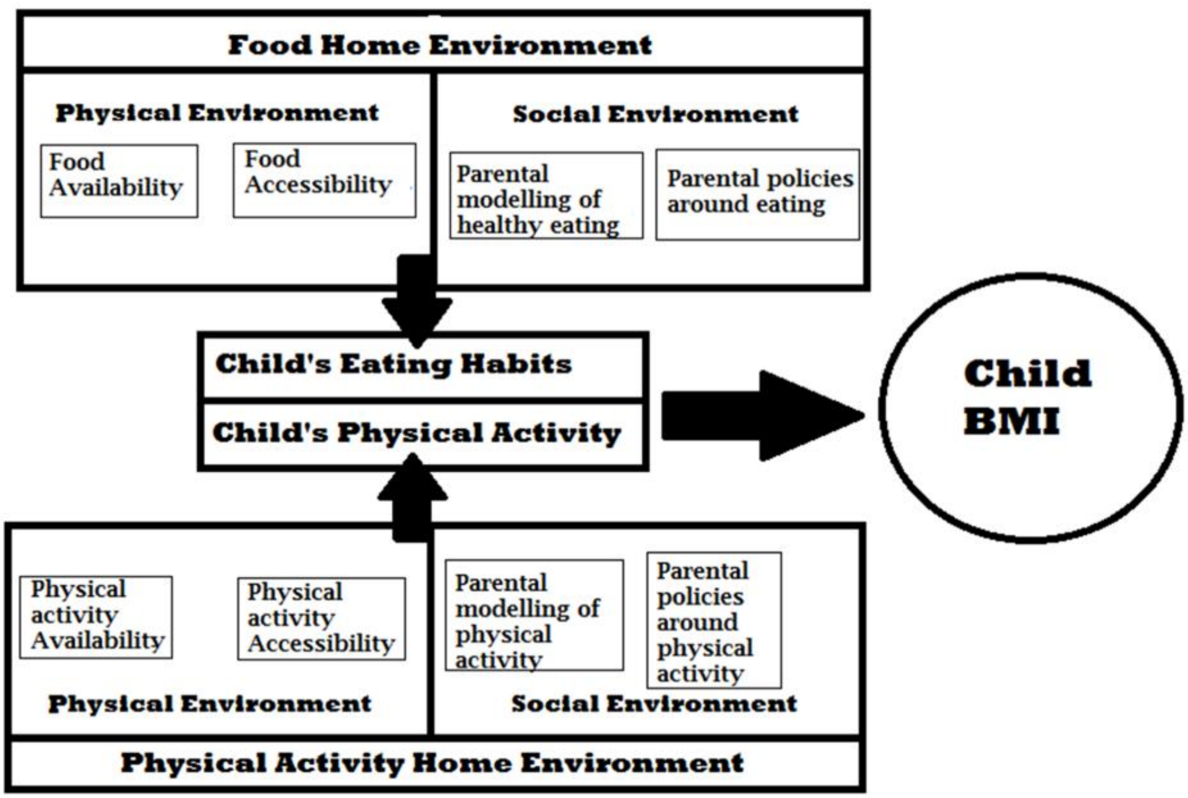


Figure 2.3 is an application of the SEM with respect to factors associated with obesity. The figure outlines four major factors which together impact obesity: biology (the influence of genetic factors and ill health), food environment (food availability and accessibility), activity environment (the environment's promotion of PA) and societal influences (the influence of culture, media and education) (NOO, 2010). This study focuses on two of these factors behind obesity, food and activity environment, which both comprise the child's home environment.

2.8.2 The Home Environment as a Determinant of Childhood Overweight and Obesity

The home environment is a term which encompasses two main areas in the Foresight SEM model of obesity (Fig. 2.3): (a) the home food environment - parents' eating habits and feeding practices, food availability and accessibility, and (b) home PA environment – levels of PA and sedentary behaviour the child engages in at home (media use, play behaviour), and availability and accessibility to PA opportunities at home and in the neighbourhood (Bryant, et al., 2008; Gattshall, Shoup, Marshall, Crane, & Estabrooks, 2008; Pinard, et al., 2011). Despite the home environment being a potentially significant factor on childhood obesity, it has only been given sufficient attention as a comprehensive significant factor contributing to childhood obesity in recent years (Bryant, et al., 2008; Gattshall, Shoup, Marshall, Crane, & Estabrooks, 2008; Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008; Johnson, Welk, Saint-Maurice, & Ihmels, 2012; Tandon, et al., 2012).

Figure 2.4. Model of PA and food home environment influences (Gattshall, Shoup, Marshall, Crane, & Estabrooks, 2008)



Gattshall et al.'s conceptual model (Fig. 2.4) is a more detailed examination of the two main home environment factors (food home environment and PA home environment) with respect to child BMI, and was used as the basis for this study. The following sections will review both the food home environment and the PA Home environment's impact on childhood obesity.

2.8.3 The Food Home Environment

Although biological factors play a role in food choice, the home food environment – both physical and social - plays an important role (Gattshall, Shoup, Marshall, Crane, & Estabrooks, 2008; Jago, Fox, Page, Brockman, & Thompson, 2010; Contento, 2011; Ledoux, Hingle, & Baranowski, 2011; Boles, Scharf, Filigno, Saelens, & Stark, 2013). One's own experiences with food in childhood vary, whether through maternal milk (in which tastes of food items such as garlic and alcohol have been detected), being picky with food, and social modelling (observation of adults and peers & parents' feeding practices (Contento, 2011). According to Gattshall's (2008) model, the food home environment's impact on child BMI falls under two main categories: the child's physical food environment (food availability and accessibility) and the social food environment (parental role modelling and parental policies around eating).

2.8.3.1 Food Physical Environment (Food Availability & Accessibility)

The food physical environment comprises both availability (the amounts of various food items present at home) and accessibility (whether or not the child has easy access to various food items). The food physical environment is extremely crucial; it is estimated that 65% of all calories consumed are at home (Nielsen, Siega-Riz, & Popkin, 2002). Children's consumption of food is based on the food they are served most often, and on which foods are found in abundance/are accessible at home/around the home, including the quantity, frequency and type available and offered to children (Patrick & Nicklas, 2005; Birch, 2006).

Studies in North America and Europe revealed that one of the strongest correlates of fruit and vegetable intake among children and adolescents was home availability of fruit and vegetables (Neumark-Sztainer, Wall, Perry, & Story, 2003; Campbell, 2009; Krølner, et al., 2011; Ding, et al., 2012). A meta-analysis of 23 previous studies examining the relationship between fruit and vegetable consumption and adiposity showed a negative association between consumption and adiposity/weight gain in adults, but found mixed results among children (Ledoux, Hingle, & Baranowski, 2011). More recently, a US study has shown a negative relationship between fruit and vegetable availability and childhood obesity (Boles, Scharf, Filigno, Saelens, & Stark, 2013). US and European studies have also shown that higher amounts of high fat foods in the household were positively correlated with higher purchases of fast food meals, inversely correlated to vegetables and milk availability at home, correlated with greater high unhealthy food intake at home and in young people (Patterson, Kristal, Shannon, Hunt, & White, 1997; Raynor, Polley, Wing, & Jeffery, 2004; Boutelle, Fulkerson, Neumark-Sztianer, Story, & French, 2006; Campbell, et al., 2007; Pearson, et al., 2012).

Food availability is influenced by the economic environment of the household. Economic factors include the cost of healthy versus unhealthy food, people's income and level of food insecurity (access at all times to enough food for the healthy life of a household), the amount of time available to spend on food related activities, the consumer's level of education which may affect his/her pursuit of health and grocery trends (still highly debated), and shopping patterns (whether the consumer shops for convenience, shops carefree or economise through use of coupons) (Wardle, Parmenter, & Waller, 2000; Adams, Grummer-Strawn, & Chavez, 2003; Drewnowski & Darmon, 2005; Contento, 2011; Monsivais, Aggarwal, & Drewnowski, 2012). Some studies describe the impact of SES on food choice and ultimately obesity is known as the "Income Effect", which displays a strong correlation between income and BMI. In developed countries, higher income results in greater financial freedom to practice healthy eating habits and exercise, whereas families with low incomes have less freedom, thus buying cheaper, unhealthier foods that are sugar, fat and energy filled to economise and satisfy their hunger (James, Nelson, Ralph, & Leather, 1997; Kinra, Nelder, & Lewendon, 2000; Drewnowski A. , 2004; Ezzati, et al., 2005; Contento, 2011). Despite these studies highlighting the Income Effect, the mechanisms behind SES's influence on food availability remain unclear, with factors such as taste, purchase and preparation convenience, health and education being cited by other studies in developed countries (Steptoe, Pollard, & Wardle, 1995; Glanz, Basil, Maibach, Goldberg, & Snyder, 1998; Connors, Bisogni, Sobal, & Devine, 2001; Kontinen, et al., 2013). Despite the Income Effect being a useful model in describing the socio-economic divide in obesity in developed countries, it might not be useful to apply to developing countries, where there is an obvious scarcity of resources, hard manual labour, high energy expenditure in lower SES groups, increasing availability of food to the rich, and sometimes cultural norms which label large size as a sign of wealth or beauty (Ball & Crawford, 2005; Song, 2006). In the MER, numerous studies have shown that larger size, particularly among women, is desirable due to cultural preferences (Musaiger, Shahbeek, & Al-Mannai, 2004; Rguibi & Belahsen, 2006; Rguibi & Belahsen, 2006; Musaiger, 2011). The association between ideal body weight and socio-economic variables has not been investigated in the MER.

Food accessibility refers to how easily attainable food items are to the child, in terms of preparedness to eat and location of food. Krølner et al.'s (2011) extensive review of determinants of fruit and vegetable uptake in children and adolescents stated that low accessibility to fruit and vegetables in households that have them was a barrier to consumption. These food items were not visible or accessible in form or location to children, who perceived fruit and vegetable preparation to be an adult task. This is particularly significant for young children who are not yet able to play in the immediate neighbourhood. For older children, food accessibility also pertains to the immediate neighbourhood surrounding the home. The availability and accessibility of food in the immediate built environment is somewhat difficult in low SES areas in several countries, due to little access to supermarket chains selling healthy food options, coupled with an increased concentration of cheap and unhealthy fast food chains (European Food Information Council, 2005; Cummins, McKay, & MacIntyre, 2005 Nov; Powell, Slater, Mirtchevam, Bao, & Chaloupka, 2006; Smoyer-Tomic, Yasenovskiy, Cutumisu, Hemphil, & Healhy, 2008; Lee, 2012; Richardson, Boone-Heinonen, Popkin, & Gordon-Larsen, 2012). Research on both adult and childhood weight has also shown a negative correlation between BMI and supermarket accessibility (Procter, Clarke, Ransley, & Cade, 2008; Rosenshein, 2009; Saelens, et al., 2012).

2.8.3.2 Food Social Environment

Through the home food social environment (parents and family structure), parents influence obesity in various ways: modelling (parental eating habits and knowledge of healthy food), parental control over food availability and accessibility to the child, meal structure and cohesiveness, and parental policies around eating (how parents foster their child's eating habits, and general parenting styles) (Kremers, Brug, de Vries, & Engels, 2003; Golan & Crow, 2004; Gattshall, Shoup, Marshall, Crane, & Estabrooks, 2008; Jago, Fox, Page, Brockman, & Thompson, 2010; Jurkowski, et al., 2013; Larson, Wall, Story, & Neumark-Sztainer, 2013).

2.8.3.2.1 Parental Role Modelling

Several studies state that the one of the most significant predictors of childhood obesity is parental obesity. Parental overweight and obesity raises the risk of childhood overweight and obesity, resulting in children being more likely to develop overweight or obesity as children and later as adults – most studies revealed that having one overweight/obese parent had a positive association with childhood overweight, having two overweight/obese parents are overweight or obese had a stronger positive correlation, and the strongest positive correlation was when both parents were morbidly obese (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997; Danielzik, Langnäse, Mast, Spethmann, & & Müller, 2002; Davis, McGonagle, Schonei, & Stafford, 2008; Whitaker, Jarvis, Beeken, Boniface, & Wardle, 2010). Some studies noted that even though both parents' overweight were significant factors, maternal-child associations were especially strong (Strauss & Knight, 1999; Danielzik, Langnäse, Mast, Spethmann, & & Müller, 2002; Melgar-Quinonez & Kaiser, 2004; Whitaker, Jarvis, Beeken, Boniface, & Wardle, 2010). These studies were mainly conducted in developed countries, but reports from developing countries also confirm this relationship between parental and child/adolescent weight status (Aljunaibi, Abdulle, Sabri, Hag-Ali, & Nagelkerke, 2013; Lee, Duffey, & Popkin, 2013).

Parental modelling, lifestyles, knowledge, attitudes and behaviours are also significant factors behind children and adolescents' eating habits (Lindsay, Sussner, Kim, & Gortmaker, 2006; Jurkowski, et al., 2013) and obesity prevalence (Crossman, Sullivan, & Benin, 2006; Jago, Fox, Page, Brockman, & Thompson, 2010). Patrick and Nicklas (2005) stated that eating behaviours result from the availability of and preference for particular foods and mealtime structure, all of which are dependent on the family. In other words, children's choice of food is based on the food they are served most often, which depends on the type and frequency of food at home and parents' tastes and consumption habits (Patrick & Nicklas, 2005; Birch, 2006; Lindsay, Sussner, Kim, & Gortmaker, 2006; Vereecken, Haerens, Bourdeaudhuij, & Maes, 2010). Parental knowledge of healthy versus unhealthy foods may also play a part in childhood obesity. Studies also revealed that predictors of child fruit and vegetable consumption included parental intake of fruit and vegetables, parental modelling, parental support for eating healthy foods, and also parental belief that fruits and vegetables would reduce the risk of cancer in their children (Gibson, Wardle, & Watts, 1998; Rasmussen, et al., 2006; Attorp, et al., 2014).

Family cohesiveness may also play a part in dietary eating habits. Cohesive family dinners have been found to be associated with healthier eating habits – for instance higher fruit, vegetable, fibre and milk intake, and less fried food, saturated fat, trans-fat, soda intake and higher breakfast consumption in two studies based in the US and one in Cyprus (Gillman, et al., 2000; Franko, et al., 2008; Kalavana, Lazarou, & Christodoulou, 2011). Frequency of family eating was also inversely associated with overweight/BMI in childhood & adolescence in numerous studies based mainly in the US, and also in Finland and Japan (Taveras, et al., 2005; Gable, Chang, & Krull, 2007; Hammons & Fiese, 2011; Larson, Wall, Story, & Neumark-Sztainer, 2013). However, one recent US study revealed that parental policies supporting family meals increased preschool children's intake of 'junk' food, and mothers involved in this study were housewives with no college education (Østbye, et al., 2013). It is therefore possible that education and also particular cultural settings may promote unhealthy food items through family cohesion or consumption of local unhealthy foods.

Maternal employment is another factor in overweight and obesity rates. Numerous US studies have demonstrated that mothers who worked full-time during their offspring's childhood period were more likely to have an overweight/obese child – especially if full time work occurred during early childhood (Anderson, Butcher, & and Levine, 2003; Cawley & Liu, 2007; Coley & Lombardi, 2012; Yayitra, 2012) although a more recent study (Gwozdza, et al., 2013) of eight European countries showed little association between maternal employment and childhood diet, PA or obesity. Maternal employment usually relates to a decreased time spent cooking, an increased expenditure on and consumption of fast-food, prepared foods and food eaten outside the home, and tend to be associated with less family meals (Crepinsek & Burstein, 2004; Cawley & Liu, 2007; Anderson, 2012). Moreover, leaving children with informal childcare (extended family members, grandparents, neighbours) may influence children's eating patterns and PA negatively, making them more vulnerable to being overweight (Maher, Li, Carter, & Johnson, 2008; Pearce, et al., 2010). Parental employment may also increase the child's reliance on lower quality food prepared outside the home, but several US and UK studies have found a social gradient where children of higher SES homes with maternal employment were healthier than those in lower SES homes (Anderson, Butcher, & and Levine, 2003; Scholder, 2009). This may be due to high SES parents being able to provide better care and food quality in their absence, and also because of education and knowledge of healthy/unhealthy food.

One cannot observe parental food modelling without taking into context the social and cultural factors that influence a family's eating habits. This includes the impact of various role models (family and friends), social and cultural standing of the social surroundings, and the cultural food habits practised (types of food eaten, food eaten on holidays and religious festivities) (Contento, 2011; Salvy, Elmo, Nitecki, Kluczynski, & Roemmich, 2011). People usually consume food that (a) they are brought up with at home, and (b) are served during festivities – both are influenced by food that the larger society culture and taboos – for instance the Jewish & Muslim taboo on pork (Latham, 1997). Also, intra – household food allocation may account for food choice, particularly when certain groups (age and gender based) are allocated types of food (eg. meat); some studies have shown that males are valued more than women in various countries (Luo, Zhai, Jin, & Ge, 2001; Gittelsohn & Vastine, 2003). Social and cultural factors, although major determinants of obesity, may be confounded by various other influences, namely SES factors (education, income of the main provider) which influence the type of food available at home.

2.8.3.2.2 Parental Policies Around Eating

Parenting styles have also been studied with respect to child's dietary habits. Studies have demonstrated that parents' use of food restricting practices (not allowing their children to eat) and pressuring children to eat are associated with higher BMI in children (Faith, et al., 2004; Webber, Hill, Cooke, Carnell, & Wardle, 2010). This is due to parents not allowing children to exercise self-regulation, thus changing the child's focus from internal hunger and satiety cues to external cues, which in turn alters the children's control of their own weight (Faith, et al., 2004; Lindsay, Sussner, Kim, & Gortmaker, 2006; Contento, 2011). Moreover, encouraging a child to eat an un-liked food with a promised reward (usually a better tasting food, usually fat, salt and sugar laden) may further lessen the child's attraction to the un-liked food item, as it will be equated with having a bad taste (Contento, 2011).

Parents who used positive reinforcement and monitoring and were authoritative (those who clearly guide children and discipline with reason) led to healthier eating habits and higher consumption of fruits (Golan & Crow, 2004; Arredondo, et al., 2006; Sleddens, Gerards, Thijs, de Vries, & Kremers, 2011). Parents who were neglectful or permissive (who had low expectations of self-control from the child in a setting of warmth) increased their child's risk of overweight, while highly controlling authoritarian parents (who required unquestioning obedience on their children's part) had the highest risk of childhood overweight prevalence, which might be due to eating as a stress-response in a strict household (Rhee, Lumeng, Appugliese, Kaciroti, & Bradley, 2006). Crossman (2006) demonstrated that adolescent girls who perceived their parents as caring were more prone to be overweight, and adolescents who perceived their parents as too controlling over their diets had a greater risk of overweight and obesity as young adults. Sleddens' (2011) review of parenting styles and obesity studies also shows that moderate parenting with high involvement led to decreased consumption of snacks and unhealthy food items.

2.8.4 The Physical Activity Home Environment

PA is defined by Caspersen et.al (1985) as ‘any bodily movement produced by skeletal muscles that results in energy expenditure’ (p.126) which is all encompassing, including aspects of daily life, occupation, transport and leisure activities. PA and long term training’s beneficial effects include energy expenditure and lean muscle mass formation, which in turn increase the resting metabolic rate (RMR) (Connolly, Romano, & Patruno, 1999; Goran, Reynolds, & Lindquist, 1999; Speakman & Selman, 2003; Knab, et al., 2011). The NHS (2011) states the summary levels of activity for children reported by the HSE in 2008. These summary levels are divided into three levels; meets recommendations (at least 60 minutes of at least moderate intensity activity 7 days a week), some activity (30 – 59 minutes of moderate or greater intensity activity 7 days a week) and low activity (less than 30 minutes of moderate activity each day, or less than 60 minutes of moderate activity on less than 7 days a week). Moreover, the current UK PA guidelines for children state at least 60 min daily moderate to vigorous activity (Department of Health, Physical Activity, Health Improvement and Protection, 2011). In Egypt, guidelines given to reduce atherosclerotic cardiovascular disease for adults include maintaining at least 30 minutes of moderate intensity PA by all individuals (Ibrahim, 2006). Children’s guidelines have not been drawn with respect to Egypt. Studies on adherence to PA guidelines in Egypt are scarce, although a recent 34 country comparison of schoolchildren’s PA (Guthold, Cowan, Autenrieth, Kann, & Riley, 2010) (using 60 minutes of PA at least five days a week as a threshold) showed Egypt have one the lowest PA prevalence scores (3.7%). The associations between obesity and childhood PA have not been researched yet in Egypt. The lack of PA, lack of meeting regulations of PA, as well as several individual behaviours consisting of low energy expenditure and sitting or lying down are called sedentary behaviours, which include many different activities at home, at school, or in modes of transport (Biddle, et al., 2010). Studies points towards decreased PA and increased SA as significant factors behind the recent rise in obesity in children, even more so than the increased intake of energy or fat (Guillaume, Lapidus, Bjorntorp, & Lambert, 1997; Kohl III & Hobbs, 1998; Vandewater, Shim, & Caplovitz, 2004; Must & Tybor, 2005; Ortega, et al., 2007; Pahkala, et al., 2013).

Gatshall et al.'s (2008) model divides the PA home environment influence on child BMI into two sub - categories: the Physical PA Environment (availability of/accessibility to PA opportunities), and the PA Social Environment (parental role modelling and policies concerning PA and SA).

2.8.4.1 Physical Activity Physical Environment (Availability & Accessibility)

When the child's PA physical environment is examined, the major areas that present significant PA opportunities in terms of availability (presence of PA promoting facilities) and accessibility (how easily the child can access these facilities) are the home, local neighbourhood) and school (Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008).

With respect to PA/SA behaviour opportunities at home, the presence of a large yard at home, and the presence/ownership of outdoor play equipment was positively correlated with children's PA levels (Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008). Moreover, the presence of TV in young people's bedrooms (Biddle, et al., 2010; Cillero & Jago, 2010; Sisson, Broyles, Newton, Baker, & Chernausek, 2011) and access to the internet/computer usage (Salmon, Timperio, Telford, Carver, & Crawford, 2005; van Sluijs, Page, Ommundsen, & Griffin, 2010; McMinn, et al., 2011) have been shown to decrease levels of child PA and increase SA through increased usage. Several studies have reported a significant relationship between media usage (television viewing, computer usage and/or video game usage) and childhood and adolescent obesity (Kohl III & Hobbs, 1998; Robinson, 2001; Vandewater, Shim, & Caplovitz, 2004; Mendoza, Zimmerman, & Christakis, 2007; Wells, et al., 2008; Yi, Yin, Chang, & Xiao, 2012). Although studies on MER children and adolescents are scarce, a recent study on Bahraini young people aged 6-18 (Gharib & Rasheed, 2008) revealed that higher TV hours (18 hours/week or more), and higher computer hours (7 hours/week or more) showed a positive association with overweight/obesity prevalence. In addition to reducing PA, TV viewing also proves a double risk for young people through increased energy intake while eating while watching TV (Bellissimo, Pencharz, Thomas, & Anderson, 2007; Temple, Giacomelli, Kent, Roemmich, & Epstein, 2007; Biddle, et al., 2010), often eating energy dense snacks (Coon & Tucker, 2002; Francis, Lee, & Birch, 2003; Phillips, et al., 2004). The availability and usage of media items seems to be correlated to income in developed countries, where children of lower income households had lower access to PA play equipment (bikes and ropes) and greater media usage/TV viewing/access to media in their bedrooms (Biddle, et al., 2010; Tandon, et al., 2012). This may imply that lower SES households present more opportunities for SA and fewer opportunities for PA, and are therefore at a disadvantage. However, other studies have reported the relationships between media usage and children's PA and weight to be small, and often times complex (Marshall, Biddle, Gorely, Cameron, & Murdey, 2004; Salmon, Timperio, Telford, Carver, & Crawford, 2005). Also, a recent review (Maitland, Stratton, Foster, Braham, & Rosenberg, 2013) of 49 studies on aspects of the home PA environment on children's PA/SA levels revealed that while media availability at home was positively correlated to children's SA, media in the child's bedroom was less positively correlated to SA, and that PA equipment at home and in the yard was not related to PA levels. Again, these relationships have not been studied in an Egyptian setting, and given the differences between developed and developing countries – especially in the socio-economic nature of PA and obesity – this is definitely worth investigation.

The local neighbourhood quality (safety, access to facilities and equipment) - often related to SES - plays a part in health inequalities among people of low SES groups. Poor neighbourhoods, characterised by insecurity and high crime rates, prevent the population from undertaking physical exercise outdoors, thus promoting sedentary lifestyle at home, and also reduce access to health promotion messages and health care services and facilities (Pena & Baccalao, 2000). Higher SES neighbourhoods, usually suburban, are more attractive, have a higher availability of open green spaces enabling and encouraging exercise, less graffiti, are considered much safer, and have attractive public spaces/aesthetics, walking and cycling facilities, which render adults and children with access more likely to perform PA

(Mawle, 2006; Tappe, Glanz, Sallis, Zhou, & Saelens, 2013). Adults and children residing in environments characterised by greater greenery (positively associated with income) were less likely to be overweight or obese (Ellaway, Macintyre, & Bonnefoy, 2005; Evans, Jones-Rounds, & Vermeylend, 2012). Access to PA facilities and equipment led to higher levels of PA in youths (Gordon-Larsen, Nelson, Page, & Popkin, 2006; Griffith, et al., 2007; de Vet, de Ridder, & de Wit, 2011). Moreover, young people in lower SES neighbourhoods tend to engage in higher usage of screen based media (Brodersen, Steptoe, Boniface, & Wardle, 2006; Tandon, et al., 2012). A recent review of studies on significant environmental correlates of childhood obesity listed several environmental features: heavy traffic (positively), vegetation (negatively), road safety (negatively), and walkability (negatively) (Dunton, Kaplan, Wolch, Jerret, & Reynolds, 2009). The presence of recreational facilities and distance to these facilities were negatively correlated with children and adolescents' BMI (Dunton, Kaplan, Wolch, Jerret, & Reynolds, 2009; de Vet, de Ridder, & de Wit, 2011; Gilliland, et al., 2012). Although the proximity of playgrounds and facilities may not be significantly correlated to pre-school children's PA (Burdette & Whitaker, 2004; Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008), due to their young age and inability to access these areas on their own, neighbourhood quality seems to play a significant role on older children's PA and consequently their BMI. These studies and reviews predominantly reported neighbourhood quality in developed societies; similar studies in the MER are scarce, which highlights a need to examine these correlates in that setting.

Since many children and adolescents attend school and spend so much time there, the school environment is crucial in promoting their activity levels. De Vet's (2011) systematic review of reviews on correlates of childhood PA indicates that a consistent positive relationship was observed between school PA facilities and PA. Studies have shown a reduction in school PA programmes throughout the last decade (in both quality and quantity) due to the investment needed to hire certified specialists and the increasing focus on academia (Kohl III & Hobbs, 1998; Foulk & Imwold, 2004; Trost, Rosenkranz, & Dzewaltowski, 2008). Although studies on PE programmes in Egypt are scarce, one paper reported that most schools failed to meet weekly physical education requirements, due to cutbacks and to PA being given little importance as opposed to academic achievement (El Derwi, El Shirbiny, & Atta, 2011). Some studies demonstrated the effectiveness of school-based PA based interventions in decreasing children and adolescents' BMI, among other parameters (El Ansari, El Ashker, & Moseley, 2010; Gortmaker, et al., 2012; Kulinna, Brusseau, Cothran, & Tudor-Locke, 2012), while a 2011 international review by Waters et al. revealed that while school intervention practices increase levels of PA, they do not have an effect on children's fatness or on other important issues (body image concerns, unhealthy dieting habits, unhealthy attitudes to weight). El Ansari et al.'s (2010) introduction of a PA programme in an Egyptian secondary school, consisting of an after-school one hour of moderate activity three days a week for a period of three months, showed that pupils from the intervention group (participating in both the regular school PA programme and the afterschool programme) saw a 37.3% decrease in overweight levels (measured by BMI), whereas the controls (who only attended the school's regular PA programme) only saw a 12.5% decrease.

2.8.4.2 Physical Activity Social Environment

Parents may influence their child's obesity through two pathways; firstly through role modelling of parental behaviour (particularly their interest and levels of physical activity) and secondly through parental support and encouragement (Welk, Wood, & Morss, 2003; Gattshall, Shoup, Marshall, Crane, & Estabrooks, 2008; Zecevic, Tremblay, Lovsin, & Michel, 2010; Waters, et al., 2012).

Studies and intervention studies have shown mixed findings regarding the relationship between parental PA levels and children's PA levels. Some studies revealed that parents' PA has a strong positive correlation with children's PA - children whose parents were both usually physically active were more likely to engage in PA than those with parents who were both physically inactive (Moore, et al., 1991; Kohl III & Hobbs, 1998; Welk, Wood, & Morss, 2003; Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008; Crawford, et al., 2010; Holm, Wyatt, Murphy, Hill, & Odgen, 2012) while Gustafson and Rhodes' (2006) systematic review of parental correlates of PA in children and early adolescents reported that several studies showed mixed and inconclusive findings, and one study showing a negative relationship (especially in older youth). Parents' SA and TV viewing showed a positive relationship with their children's SA and TV viewing (especially daughters) (Jago, Fox, Page, Brockman, & Thompson, 2010; Cillero & Jago, 2010). Recently, Tandon et al.'s (2012) home environment study reported that children engaged more with their parents in TV/DVD watching than in PA. Gustafson and Rhodes' (2006) systematic review, however, reported that several studies showed no relationship and only one study which showed a negative relationship (especially in older youth). Moreover, Lim & Biddle's (2012) more recent review of 11 demographic, psychological and behavioural parental correlates revealed that most studies demographically consisted of white middle class participants who themselves volunteered for the study, which may imply that cultural factors may play an effect in their PA levels. Socio-economic differences in parental PA have also been cited from developed countries, where higher SES parents practiced higher amounts of PA than their low SES counterparts (Kohl III & Hobbs, 1998; Lindström, Hanson, & Ostergren, 2001; Giles-Corti & Donovan, 2002; Lee, et al., 2007). In studies of high income countries, PA is more leisure based, whereas in low and middle countries (where studies are fewer) PA is usually occupational (Bauman, et al., 2012; Macniven, Bauman, & Abouzeid, 2012).

Additionally, parental perceptions and support also play an important role. Parental encouragement and support of PA and activity at home has been shown to increase children and adolescents' PA levels (Kohl III & Hobbs, 1998; Sallis, Prochaska, & Taylor, 2000; Gustafson & Rhodes, 2006; Springer, Kelder, & Hoelscher, 2006; Waters, et al., 2012; Kegler, Swan, Alcantara, Feldman, & Glanz, 2013; Østbye, et al., 2013). This is mainly dependent on parents' perception of the importance of PA; if they value PA, they are more likely to provide support for their child regardless of the child's current PA behaviour (Trost, et al., 2003). Parental support/encouragement and beliefs about PA are significant predictors of moderate to vigorous PA and outdoor playtime in children, and consequently less TV viewing (Trost, et al., 2003; Bauer, Nelson, Boutelle, & Neumark-Sztainer, 2008; Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008; Sleddens, Gerards, Thijs, de Vries, & Kremers, 2011; Lowry, Lee, Fulton, Demissie, & Kann, 2013). Child PA outdoors in the immediate neighbourhood was also dependent on parents' perceptions of the surrounding area; parents who did not consider their neighbourhood to be safe did not allow their children to engage in outdoor play; those children practiced less PA and watched more TV (Sallis, McKenzie, Elder, Broyles, & Nader, 1997; Burdette & Whitaker, 2005; Cecil-Karb & Grogan-Kaylor, 2009; Datar, Nicosia, & Shier, 2013). Moreover, parental concern about TV watching in their children may adversely affect children, as parental restriction of TV watching has been shown to have a negative correlation with TV time among both children and adolescents (Cillero & Jago, 2010; te Velde, et al., 2011).

Parental perceptions of PA are based on socio-economic factors and culture. Studies in developed countries have consistently shown a positive relationship between various socio-economic factors (SES, income and education) and adult/youth PA (Gordon-Larsen, McMurray, & Popkin, 2000; Kahan, Fogelman, & Bloch, 2005; Cohen, et al., 2012; de Munter, Agyemang, Brewster, Stronks, & van Valkengoed, 2012; Suppli, et al., 2012). Culture plays an important factor in this study's setting, as a gender based difference in attitudes towards sports exists in predominantly Muslim countries (like Egypt), whereby girls/women may face obstacles to PA due to religious–based modesty issues and culturally acceptable public behaviour (Al Mahroos & Al Roomi, 2001; Walseth & Fasting, 2003; Dagkas, Jahromi, & Talbot, 2010). This may lead to parents' encouragement of boys' PA and discouragement of girls' PA. This trend was observed in recent Egyptian studies of adolescents, where boys outperformed girls in PA (girls were more academic) and where girls' overweight/obesity prevalence was higher than boys (Fahmy, Nebal, & El Hossein, 2006; El Derwi, El Shirbiny, & Atta, 2011). Furthermore, in the Middle East, studies on perception of obesity are limited, but obesity is considered a sign of affluence in Gulf Countries like Bahrain (Al Mahroos & Al Roomi, 2001).

2.8.5 Smoking, Sleep and Obesity

The relationship between smoking and obesity is complex; some studies suggest it decreases appetite and thus body weight, while other studies display a positive relationship between smoking and obesity (Chiolero, Faeh, Paccaud, & Cornuz, 2008; Kwon, et al., 2010;

Patel, et al., 2011). Smoking may come as part of a cluster of unhealthy behaviours – such as low PA levels and unhealthy diets (Chiolero, Faeh, Paccaud, & Cornuz, 2008). Studies have also linked maternal smoking during pregnancy to a risk factor of childhood obesity (Gilman, Gardener, & Buka, 2008; Sharma, Cogswell, & Li, 2008; Gorog, et al., 2011; Durmus, et al., 2013).

Recent studies suggest that a lack of/lesser sleep in children is a risk factor behind obesity (Chen, Beydoun, & Wang, 2008; Must & Parisi, 2009; Bell & Zimmerman, 2010; Börnhorst, et al., 2012). Short sleep (for children) was defined by a 2008 meta-analysis of 15 previous studies investigating sleep in 474, 684 adults and children as less than 10 hours per day (Cappuccio, et al., 2008).

2.8.6 Family Perceptions of Obesity

Although Gattshall's (2008) study breaks down the home environment into the food and PA environments, family emerges as a central theme in both sub-domains. As mentioned previously throughout section 2.8, parental food and PA characteristics and behaviours have shown significant relationships with healthy/unhealthy child PA, food behaviours, and with obesity prevalence. Gattshall's model and other studies reveal the family context as the primary social force in childhood, as well as the likely cause of overweight/obesity in children (Ventura & Birch, 2008; Skouteris, et al., 2012).

In developed countries, parental perceptions of obesity have been significantly associated with their children's overweight or obesity, where low perceptions of overweight/obesity and of its health risks led to greater childhood overweight/obesity (Maynard, Galuska, Blanck, & Serdula, 2003; Eckstein, et al., 2006; Shirasawa, et al., 2012; Warschburger & Kroller, 2012). This is potentially harmful to children's health, as many parents do not accurately perceive or classify their children as overweight/obese, according to a number of international studies (Eckstein, et al., 2006; Hager, et al., 2012; Yao & Hillemeier, 2012; Aljunaibi, Abdulle, & Nagelkerke, 2013; Lopes, Santo, Pereira, & Lopes, 2013). One of these studies (Aljunaibi, Abdulle, & Nagelkerke, 2013) found parents' misperception of children's weight in the United Arab Emirates to be highest in parents of overweight/obese children. Moreover, studies in developed countries highlight ethnicity as a potential factor behind varying parental perceptions of childhood weight, where parents of African ethnicities/backgrounds underestimated both obesity and its health risks (West, et al., 2008; Trigwell, Watson, Murphy, Stratton, & Cable, 2013). Trigwell et al.'s (2013) paper interestingly reveals that UK parents of Somalian ethnicity perceived their daughters overweight to be healthy and that Chinese parents viewed larger sons as healthier. Ethnicity thus seems to impact weight perception, and this has been studied rarely in Middle Eastern populations. Apart from Aljunaibi et al. (2013), Middle Eastern studies involved self-perception among young people, and have found that overweight adolescents in Gulf countries, such as Bahrain and the UAE did not classify/perceive themselves as such (Al-Sendi, Shetty, & Musaiger, 2004; Musaiger, bin Zaal, & Souza, 2012). Interestingly, an Iranian study (Kelishadi, et al., 2013) revealed that among 14 year olds, girls were more likely to perceive themselves as obese. Although these studies do not involve parental perceptions of childhood weight, these self-perceptions might be indicative of parental perceptions. Although data exists with respect to these countries, one should note that all the above mentioned countries are higher income countries per capita when compared with Egypt, a lower middle income country (Musaiger, 2011; World Bank, 2013). Given that both phases of this study investigate socio-economic differences among home environments and perceptions, the data for high income Middle Eastern countries would not be applicable in Egypt's case, although some aspects (particularly religious and cultural) may be similar.

Recent studies on perceptions and attitudes towards obesity, diet and PA in Egypt are scarce. Ragab's (2007) paper examining the impact of media messages on women revealed that women exposed to messages perpetuating thinness ideals felt dissatisfied with themselves, manifesting this dissatisfaction in eating disordered attitudes and compensatory behaviours such as dieting and veiling. Aboulfoutoh et al.'s (2008) investigation of central obesity in Egyptian adults also revealed that one third of the studied sample (n = 560, 31.5%) perceived their weight was unhealthy, some of which desired to change (72.3%) and even less attempted to change it (59.4%). El Derwi's (2011) examination of teachers and students' attitudes towards obesity in Fayoum (a rural Egyptian town) revealed that of the young people measured, only 18.3% perceived themselves as overweight/obese with a tendency to underestimate their own weight. No studies were found on Egyptian mothers' perceptions of their own children's weight.

Given the afore mentioned studies on family perceptions concerning childhood weight, and also given studies showing that childhood obesity interventions which include families (or were aimed at them) were effective in reducing obesity in children (Golan & Crow, 2004; Towey, Harrell, & Lee, 2011; Davidson, Jurkowski, Li, Kranz, & Lawson, 2013), parental perceptions of obesity in a collectivist country like Egypt - where family is central in daily life (Aldinger & Bauernfeind, 2001; Rudy & Grusec, 2006; U.S. Library of Congress, 2011) - is quite important. The difference in perception of children by gender is also an important issue that needs to be observed in Egypt due to the PA obstacles that girls/women face based on cultural (hence family) perceptions (Walseth & Fasting, 2003; Dagkas, Jahromi, & Talbot, 2010; Al Mahroos & Al Roomi, 2001).

2.8.7 Home Environment Measurement Tools

There are a number of tools that have been developed and used to measure the home environment in relation to dietary and PA behaviours. This section highlights and describes these tools.

2.8.7.1 Home Observation for Measurement of the Environment (HOME –SF)

The first tool to measure the home environment was the Home Observation for Measurement of the Environment – Short Form (HOME-SF) and was mainly used to investigate the home environment as a contributor to child development. HOME-SF was developed in the US by Elardo, Bradley & Caldwell (1975) as part of a longitudinal study to examine the home environment and SES on child development (particularly on infancy and early childhood, age 6 and under). It examined aspects of physical (presence of toys, indoor and outdoor activities) and cognitive (language stimulation, parent-child interaction, nature of child's activities) development through home visit assessments (Totsika & Sylva, 2004). It was only in the late 1990s that the HOME-SF survey was used to assess correlations with childhood obesity (Strauss & Knight, 1999).

2.8.7.2 Recent Home Environment Measurement Tools

Since the late 2000's, numerous studies have investigated the home environment holistically or have tried to create holistic tools to measure home environment correlates (Bryant, et al., 2008; Gattshall, Shoup, Marshall, Crane, & Estabrooks, 2008; Østbye, et al., 2013; Pinard, Yaroch, Hart, McFerren, & Estabrooks, 2013). Bryant et al.'s study (2008) involved the creation and assessment of the HHS to measure the physical and social factors in the home that influence children's food home environment and PA home environment. The factors examined included PA versus SA (duration of watching television, playing videogames, sleeping, active play, moderate play, and dancing), play behaviour (availability of a yard and wheeled toys), food availability (availability of vegetables, fruit, salty and sweet snacks, soda and candy), parental feeding habits (using food as rewards, restricting food), general household and area characteristics (proximity of recreational areas and sports centres, presence of sidewalks), media usage (availability of TVs, videogames, laptops), parental media controls, and household health (parents' health practice).

Moreover, Gattshall et al. (2008) presented another valid and reliable tool for the measurement of the home environment with respect to children's dietary habits and PA, called the Home Environment Survey (HES). As with the HHS, the HES comprehensively examines the food home environment and the PA home environment through assessing ten scales: PA availability, PA accessibility, fruit/vegetable availability, fruit/vegetable accessibility, fat/sweet availability, fat/sweet accessibility, parental role modelling of PA, parental role modelling of healthy eating, parental policies to support PA and parental policies to support healthy eating. Although a very useful tool, which strictly follows Gattshall et al.'s model of home environment influences on BMI, the HES does not fully take into account neighbourhood characteristics despite looking at PA availability and accessibility. Moreover, while the HES examines the presence of yards and play areas in the immediate household vicinity, there is no mention of recreational areas, road and traffic conditions or proximity of sport centres/clubs. Very recently (2013), a third tool, the Comprehensive Home Environment Survey (CHES) was developed and examined the home food environment, PA environment and media environment with respect to childhood obesity (Pinard, Yaroch, Hart, McFerren, & Estabrooks, 2013). Pinard et al.'s (2013) paper concludes that the tool is valid/reliable and is a promising tool in measuring home environment factors' impact on children's weight.

2.9 An Examination of the Study Setting: Egypt

2.9.1 Egypt's Economic standing and Poverty

According to the latest World Bank data (2013), Egypt is classified as a lower middle income level country (defined by the World Bank as having a GNI per capita of $1,006 - $3,975 in 2010), with a GDP equivalent of $257.3 billion. The number of people living below the Egyptian income poverty line in the 2008-9 period was 16.3 million people, the largest increase being observed in metropolitan areas, and even though Egypt's economic situation has improved over the last few decades, the result was not felt in terms of citizens' and children's wellbeing (measured by numerous health, shelter, gender, education and information disparities) (UNICEF Egypt, 2010). The World Bank (2013) reported that 25.2% of the 80.72 million Egyptians live below the poverty line. Although the Egyptian government employs certain pro-poor policies to help reduce costs of living, such as social security systems (pension plans), engaging families in home industries and employment creation for graduates, these programmes are unsatisfactory in coverage and financial aid (Abdel Azim, 2011). Additionally, the Egyptian government has no poverty monitoring system (Sabry, 2009).

Table 2.4. Poverty estimates in Egypt (1990-2009) (Sabry, 2010)

	1990	1995	2000	2005	2009
Poverty headcount ratio, Urban (%)	20.3	22.5	9.3	10.1	11.0
Poverty headcount ratio, Rural (%)	28.6	23.3	22.1	26.8	28.9
Poverty headcount ratio, Total (%)	25.0	22.9	16.7	19.6	21.6

According to the World Bank and the Central Agency for Public Mobilisation and Statistics (CAPMAS) (Egypt's national statistics agency) (2012) (Fig 2.5), the urban poverty percentage is 11% and has been decreasing since 1990 (20.3%). However, national surveys are known to greatly underestimate poverty in Cairo and the costs of living, due to ever-changing definitions/boundaries of the Cairo area by the government, and researchers' reluctance of surveying informal slum settlements (Sabry, 2010). Statistics following the 2011 Egyptian revolution are not available, but the Egyptian economy has been badly affected (the International Monetary Fund states that Egypt in 2012 has a financing gap of $24 billion) and the country may be on the brink of a currency crisis (Khan, 2012).

2.9.2 The Changing Urban Ecology of Cairo

Greater Cairo is the capital of Egypt. The Cairo metropolitan area comprises parts of four Governorates (equivalent of counties), Cairo and Helwan on the East Bank of the Nile and Giza and 6th October on the West Bank (Hassan, 2011). Central Cairo is located on the East Bank of the Nile River and is comprised of Historic/Islamic Cairo, founded by the Fatimid Dynasty in the 10th century A.D. and containing many historic sites (Williams, 2006). Historic/Islamic Cairo defined Cairo's borders till the 1860s (Sims, Sejoume, & El Shorbagi, 2003). Also in the heart of Cairo is Colonial Cairo (known ever since as Downtown Cairo), built and developed in the 1860's under the Khedivial Ottoman Dynasty, whose urban expansion (lasted till the mid-20th century) gave rise to suburbs along the East bank of the Nile (Abbasia, Shubra, Maadi), and to the North East of Historic Cairo (Heliopolis) (El Kadi & ElKerdany, 2006). Expansion of suburbs on the West bank of the Nile (Giza) occurred after WWII, with the rapid growth of Cairo's population (El Kadi & ElKerdany, 2006; Sims, Sejoume, & El Shorbagi, 2003). The Egyptian population in 2012 was estimated at 81,468,977 (CAPMAS, 2012).

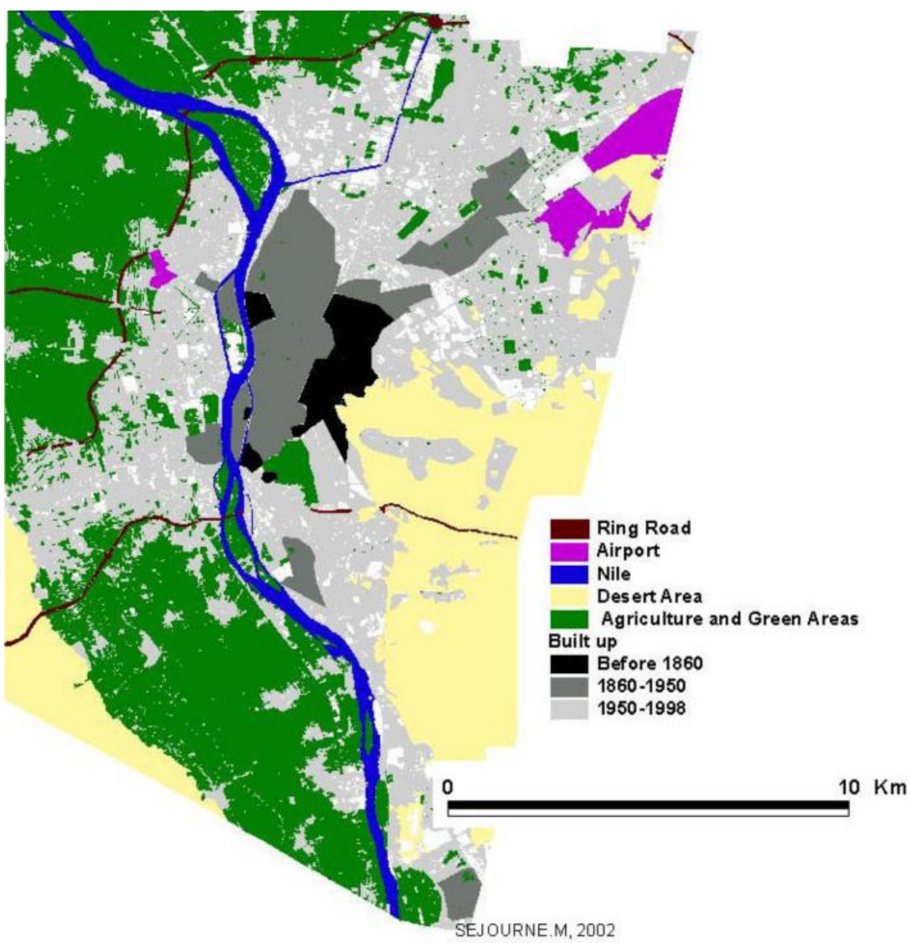
The second half of the twentieth century, particularly since the 1980s, has seen a massive expansion in the Greater Cairo area in both population and in spatial area (Sims, Sejoume, & El Shorbagi, 2003; Hassan, 2011) (also see Fig 2.7). The already existing districts of Islamic Cairo and Colonial Cairo (once the vibrant, cosmopolitan home of the upper and middle classes) have deteriorated, becoming undesirable to live in due to confused ownership, neglected maintenance, and increased cheap renting to rural migrants (generally of lower SES) (Sims, Sejoume, & El Shorbagi, 2003). The expansion of Cairo included building satellite shantytowns and urban pocket slums within the city (such as Matariya) and on the periphery (Al Nahda) to accommodate the rising number of migrants/low SES workers unable to afford costly rent (Sims, Sejoume, & El Shorbagi, 2003; Denis, 2006).

Figure 2.5. An urban slum in Cairo, Egypt reprinted with permission (Sims, Sejoume, & El Shorbagi, 2003)

These urban slums (as shown in Figure 2.6) are often randomly constructed, with little or no planning. Construction is generally basic and quality and aesthetics are generally poor.

Another result of the deterioration of the once vibrant Downtown Cairo was the migration of middle and upper classes out of that area over the last few decades, either into existing suburban areas (Heliopolis and Madinet Nasr) or to secured gated communities outside metropolitan Cairo, built in the 1990s and 2000s on the outskirts of the city (such as 6th of October City, Palm Hills, Qattamiya Heights) (Denis, 2006).

Figure 2.6. (Top) a middle SES suburb in Egypt (Photo taken by Mahmoud Shaltout) and (Below) Expansion of Cairo - 10th century – 1998 (not including gated communities built afterwards reprinted with permission (Sims, Sejoume, & El Shorbagi, 2003)



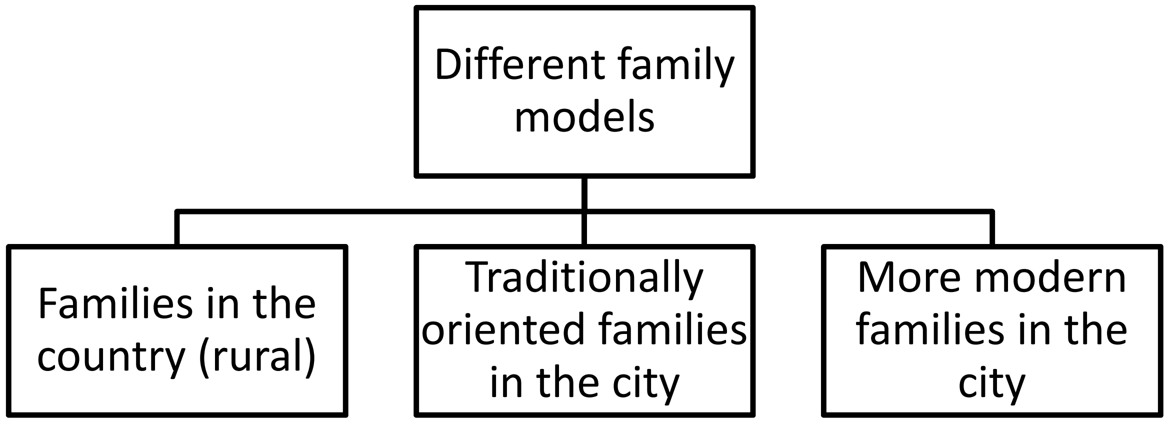
2.9.3 Family Structure and Changes in Egypt

* **<u>Note:</u>** *Studies on Egyptian families and family structure are limited, and several main studies on Egypt are funded or executed by external bodies.*

While Egypt has undergone massive social, political and cultural changes throughout the 19th and 20th centuries, the family has remained the most important single unit in Egyptian society, and has not changed much in that period. Egypt is a characteristically collectivist culture, wherein families, kinship and interdependence play a significant role in almost all aspects of life (Aldinger & Bauernfeind, 2001; Rudy & Grusec, 2006; U.S. Library of Congress, 2011). The values held in the highest regard - honour and dignity - stem from the notion of family, and the notion of a person's consideration of him/herself as part of a larger group; a large part of an Egyptian's identity stems from his/her kinships and family (U.S. Library of Congress, 2011).

Moreover, Aldinger & Bauernfeind’s (2001) comparative study of Egyptian and German families presents the only model found which categorised Egyptian families. Egyptian families are classified into three categories based on the social context/setting in which they are found (Figure 2.8).

Figure 2.7. Egyptian Family Models adapted from Aldinger and Bauernfield (2001)



The first category in Aldinger & Baurenfield's (2001) model - families in the country - is the traditional Egyptian family model. In this situation, the family is the main institution, and runs on a highly patriarchal system where males and elders dominate. In the country, both men and women share the hard physical labour on farms, while women are expected to run the household as well. Free time is spent entirely among nuclear and extended family members. The second category - traditionally oriented families in the city - share similar close family ties. This type of family is generally found in lower middle and lower SES groups, and exhibit the same patriarchal dominance. In this case, the man takes care of the household income, children are encouraged to help out in labour, and women/girls are restricted from going too far away from home without male supervision (Aldinger & Bauernfeind, 2001). Lastly, modern families in the city, although regarding family as an important aspect of life, consider themselves as part of a national/global unit rather than members of a family. This type of family is prevalent in higher middle SES and higher SES groups, and social rules are more relaxed. It is typical of family members to spend more time with friends and peers rather than with family. Women are given more freedom and are encouraged to work, and are allowed to be in pre-marital relationships considering their virginity is untouched. However, in all three types of families, the woman is expected to do the housework and raise the children (Aldinger & Bauernfeind, 2001; Auter, Agnihotri, Reda, Sharif, & Roy, 2009).

Family interaction in Egypt occurs from a very young age, and on a daily basis. Children growing up are encouraged to socialise and interact with siblings, cousins, extended cousins, etc. Family proximity is also a norm in Egyptian society. In Egypt, the desired family living situation is an extended family living together in the same location or building (Aldinger & Bauernfeind, 2001; U.S. Library of Congress, 2011). However, with the increased move to major urban areas such as Cairo, this has resulted in the increase in a nuclear family style of living (whereby a married couple and their children reside in separate housing). Despite this pattern rising in Egyptian cities, this has not deterred family members from living within close proximity of one another. For example, when a new couple weds, it is customary to move to housing close to the groom's family. Usually, the groom's brothers and their families will also reside in a nearby location. Moreover, family gatherings are a staple of Egyptian society, and occur frequently, in particular on weekends and national/religious holidays. These family gatherings not only bring together an immediate family, but also extended family members (grandparents, uncles, aunts, nieces, nephews) (U.S. Library of Congress, 2011).

Since family plays such an important role in Egyptian society, marriage is central. Despite divorce rates increasing over the last few decades, households consisting of married couples remain prevalent in Egypt (Smallman, 2008). This is due to Egypt's collectivist culture which dictates marriage; marriage is often seen as not only an obligation in an extremely religious society, but as a gateway to social acceptance and sexual expression. In addition, the majority of Egyptian women regard their duties as a wife, mother and housewife more important than that of a worker, given the cultural expectations on them to tend to the children and household (Aldinger & Bauernfeind, 2001).

Women in Egyptian societies tend to stay at home and look after the family (Smallman, 2008). This is evident when examining Egyptian State Information Service statistics (2006), which show that despite making up 49% of the Egyptian population, women made up only 22.3% of the workforce in 2006. In 2012, World Bank indicators revealed that labor participation rate from women aged 15+ was slowly rising, from 18.2% in 2002 to 23.6% in 2012 (Trading Economics, 2014). In 2010, the United Nations Development Programme

(UNDP)'s report on Egypt's human development ranked Egypt 120th out of 128 countries in terms of female labour participation. In addition, results from the 2006 Egypt Labour Market Panel Survey revealed that unemployment rates among women were triple that of men according to the American University in Cairo's (AUC) Social Research Centre (2011). The AUC document (2011) reveals a sexual division of labour, in which men mainly occupy highly skilled, better paid occupations while women tend to work in low skilled occupations. Moreover, the document states that women are discriminated against in the workplace, being seen as 'expensive employees' by employers due to maternity leave and nursing hours allowed for breastfeeding per day. Moreover, the UNDP (2010) reported that within the workplace - usually in the private sector jobs – women are subjected to power inequalities, lack of equal access to economic resources, and sometimes sexual harassment that often goes unreported to the authorities. The UNDP (2010) also stated that female employment was hindered by marriage, as the space between school completion and age of marriage (mid-to-late twenties) is short. In fact, while most unemployed men (aged 15-29) find jobs by age 29, most unemployed women in that bracket never become employed. These reasons might discourage women from entering the workforce, coupled with cultural expectations of wives and mothers (Aldinger & Bauernfeind, 2001).

Egypt has experienced a reduction in total fertility rates (28%) between the 1970's and 1990's (Eltigani, 2003), but the reduction has stalled since the late 1990's - the total fertility rate in Egypt among women aged 15-49 according to the 2008 EDHS is 2.7 per woman in urban areas and 3.2 per woman in rural areas (El-Zanaty & Way, 2009).

Although family is an important factor in all aspects of life in Egyptian society, the role of the family in overweight/obesity has not been examined. Researchers have often focused on socio-economic factors when studying developing countries. Even though socio-economic factors may play a part in determining obesity, cultural factors such as family (under which socio-economic, occupational and educational factors may be grouped) that have been researched in individualist societies may provide valuable insight in understanding obesity patterns in a collectivist culture like Egypt's. The importance of family in Egypt dictates many aspects of life, such as daily activity, interpersonal relationships, socio-economic status, education, and mostly diet, and these may all affect obesity.

2.9.4 Dietary Patterns & Changes in Egypt

Very few studies have investigated Egyptian dietary habits. Galal's (2002) paper and Hassan-Wassef's (2004) review are the two studies which (given the rarity of the topic) this section heavily draws from. Hassan-Wassef's review offers a wealth of insight into Egyptian dietary habits, exploring both food traditions passed down from pharaonic times, and also documents the shift in dietary habits over the last 60 years. This was done by visiting urban and rural communities in Egypt, in-depth interviews with housewives, as well as an examination of kitchens and food storage facilities. Galal's paper investigates the changes in diet in Egyptian society following the Egyptian Revolution of 1952. Both papers were the only sources found to offer detailed insight on Egyptian diet and dietary change.

According to Hassan-Wassef's description (2004), several foods are a staple of a traditional Egyptian diet. Dark green leafy vegetables are central, including herbs (parsley, coriander), leafy vegetables (lettuce, rockets, Jew's mallow - called molokheya), green leaves of roots/bulbs (onions, radish, leeks) and leaves of edible plants (okra, various beans). The most consumed of these is the Egyptian fava bean (called ful). This is due to Egypt's ecology, rich, fertile soil, and the abundance of legumes and cereals. Fruits, which are also abundant due to Egypt's ecology, are consumed widely and availability depends on the season.

Figure 2.8. (Left) Egyptian bread, a staple of Egyptian diet, and (Right) a fruit stand, one of many found on many streets in all areas of Cairo (photos taken by Mahmoud Shaltout).

Bread is also a staple of the Egyptian's diet; in fact no meal is complete without it. Traditional wheat bread is still widely consumed, baked by several rural communities, but white bread, introduced in the 20th century, has also become very popular (especially in the form of sandwiches). Salt is also quite important, and is eaten particularly during summer in the forms of feta, olives, pickled vegetables (mekhalel), and chilli spices are dropped in favour of vinegar and lime. Traditional Egyptian diets are low in saturated fat, and oil is commonly used for cooking rather than butter. Deep-frying, a very recent innovation, is used for cooking fava beans into falafel/ta'ameyya, a very popular food. A traditional Egyptian diet lacks sweet food, however a variety of sweet desserts (such as sugar dolls) are consumed particularly on religious occasions, such as the Islamic moulid-el-nabi (the birth of the prophet Muhammad PBUH). Meat is traditionally not a staple dish (particularly red meat) with the exception of fish and pigeon. Meat is also another food that is eaten most often at religious occasions, particularly during the breaking of the fast during the Islamic holy month of Ramadan. Traditional drinks (such as karkadeh) are made of natural products, and black tea (with sugar) is usually preferred over coffee. The traditional Egyptian diet is thus mostly vegetarian in nature and is incorporated into all Egyptian diets, and observed particularly by the Copts who, throughout two thirds of the year, observe a meat-less fast (Hassan-Wassef, 2004).

Hassan Wassef (2004) also highlights the traditional meal patterns in Egypt, and describes how the last few decades have changed eating patterns, and consequently, the food being eaten. Traditionally, breakfasts are small, consisting of a drink (milk, tea), a piece of bread (as a sandwich or soaked in milk), cheese and maybe ful (fava beans). Breakfasts are larger during holidays and Fridays, when incorporating salad, cheese, and jams is common. The main meal (traditionally eaten around 3 pm), consists of bread and cooked vegetables, and meat if it is within the household budget (meat is considered a symbol of prestige and wealth). An evening meal concludes the day, and is lighter, consisting of bread, ful, or vegetables, or leftovers from the main meal. Snacks are eaten throughout the day, and may consist of fruit (which are not specific to any meal) or highly nutritious yet energy dense local snack foods (such as nuts).

Both papers acknowledge that dietary patterns in Egypt have undergone changes within the last century, particularly throughout the last 60 years and in urban areas. A nutritional transition has taken place in Egypt since the end of World War II in relation to the political and socio-economic changes and impacts. After WWII, Egypt's population growth was rapid (2.8% population growth), which led to a rapid increase in the uptake of nine main food groups (wheat, flour, maize, lentils, sugar, cooking oil, red meat, poultry, dairy products and fish) (Galal, 2002). The massive population growth led to a gap between local agricultural production and food consumption by the early 1980's, leading to the importation of foods which became incorporated into the Egyptian population and cuisine such as macaroni, processed cheeses, rice (used mostly in koshari, a local mixture of rice & lentils), frozen meats and foods, processed cheeses, flat white bread (called shami), which is now becoming more popular than the traditional wheat bread among younger Egyptians (Galal, 2002; Hassan-Wassef, 2004).

Moreover, the increased desire for a Western lifestyle has resulted in the rapid growth of fast food chains in the country, particularly in urban areas where they are in high demand particularly among young people (Euromonitor International, 2012). The change in working life has led to an increase in women working, as well as a change in work hours to a

9-to-5 model. This in turn led to the main meal being pushed to sometime after 5pm, and the increased reliance on fast-food delivery, especially by children whose school hours end much earlier than their parents' workdays. In addition, many of the traditional nutritional snacks are being shunned in favour of sweets and candy (Hassan-Wassef, 2004). A National Food Consumption Survey conducted in Egypt in 1981 and 1998, showed a marked increase in the frequency of food eaten out of the home during that period (45.8% of all household meals were eaten outside the home in 1998, compared to 20.4% in 1981) (Galal, 2002).

Few studies have examined the dietary make up of overweight and obese Egyptian children and adolescents. Gilany & Elkhawaga's (2012) paper on habits among adolescents in Mansoura (a small Egyptian city in the Nile Delta), reported that frequency of eating three meals a day was positively correlated with living in urban areas, SES and maternal education, whereas family cohesion in mealtimes were more common among lower SES groups. Hassan et al.'s (2010) paper examined diet quality in 5760 overweight and obese children aged 7-12 from six public schools in Giza (a district within Cairo), Egypt using 24 hour recall methods. This study concluded that overweight/obese children aged 7-12 consumed an overall higher mean amount of kilocalories (3746.48 kcal) than the Recommended Dietary Allowance (1400-2000 kcal), with a much higher percentage of saturated fat than recommended levels.

2.9.5 Physical Activity in Egypt

Few studies have investigated the frequency of PA or attitudes towards it in Egypt. A study in the 1990s conducted by the WHO in Egypt determined that that 52% of rural adults, 73% of urban adults from lower SES groups and 89% of urban adults from high SES backgrounds led sedentary lifestyles; these were positively correlated with obesity rates in the three groups (16%, 37% and 49%, respectively) (Galal, 2002). In addition, a study on the attitudes and beliefs of Muslim women in Egypt on sporting activities (2003) documented that women who adhere to the more fundamentalist interpretations of Islam argued that Islam encourages women to practice sport. This is however hindered by their cultural issues, notably veiling and the importance of limited gender interaction, based on society's view of women and sexuality (Walseth & Fasting, 2003).

Recently, a number of studies have investigated PA among young people (children, adolescents and young adults) in Egypt. Although a recent study of schoolchildren's PA across 34 countries (Guthold, Cowan, Autenrieth, Kann, & Riley, 2010) reported Egypt as having one the lowest PA prevalence scores (3.7%). Moreover, a gender difference was observed whereby more male adolescents practiced PA than their female counterparts (Fahmy, Nebal, & El Hossein, 2006; The Egyptian Cabinet - Information and Decision Support Centre , 2010). The Egyptian Cabinet - Information and Decision Support Centre (2010) revealed that 28.3% of young people (aged 10 - 29) do not participate in PA, and a much higher percentage of females practiced no PA (42.7% compared to 14.5% of males), and also reported that PA was slightly higher in young people of higher SES. Two recent studies examined PA among students in Mansoura University (Mansoura is an Egyptian city in the Nile Delta). The first, a cross-sectional study examining frequency and barriers to PA, revealed that 11% of students were inactive, and that the four main predictors negatively affecting PA were being from a high SES family (measured by income), being female (who were half as likely to be physically active), having a medical education, and non-membership in sports clubs (El Gilany, Badawi, El-Khawaga, & Awadalla, 2011). The second (2011) investigated freshmen students, and demonstrated that prevalence of vigorous activity was only 9.8%, the main barriers to PA being shyness regarding body image and lack of equipment, and the main drivers being support & participation from others and perceived benefits of health (Montasser, Abdel Fattah, & Helal, 2011).

2.10 Summary of Literature Review, Rationale and Aims of the Study

The literature review has shown, through many studies carried out mainly in developed countries, that home environment variables impact food and PA behaviour of children, which may play a part in childhood obesity prevalence (Strauss & Knight, 1999; Totsika & Sylva, 2004; Patrick & Nicklas, 2005; Crossman, 2006; Jago, Fox, Page, Brockman, & Thompson, 2010). Although recent tools have comprehensively investigated the home environment (Bryant, et al., 2008; Gattshall, Shoup, Marshall, Crane, & Estabrooks, 2008) on children, none have directly measured their relationship with childhood BMI Z-scores in Egypt.

Obesity is prevalent in Egyptian society, particularly among adult women. Current WHO (2010) data indicates prevalence in adult males over 15 years in Egypt is 64.5%, and prevalence in adult females over 15 years is 76%. Obesity prevalence has also been rising in young people (El-Zanaty & Way, 2009). Moreover, research on Cairo has revealed huge physical differences between residential areas of different socio-economic groups (Sims, Sejoume, & El Shorbagi, 2003; Denis, 2006). Despite this, research has neither investigated the different home food and physical environments in Egypt, nor their relationship with childhood obesity. Given that findings highlight an inverse relationship between increasing BMI and productivity, coupled with the current global economic crisis, these issues need to be examined in an attempt to avoid future health problems, costs and productivity decrease in a developing economy such as Egypt.

This study is also important as the culture in Egypt and the Middle East is a collectivist one wherein the most important and central unit of society is the family (both nuclear and extended) (Abudabbeh, 1996). Despite the nuclear family being the most common Egyptian family arrangement in urban areas (80-90%), extended family members and their interactions have an impact on everyday life, and proximity of extended family is considered ideal as they are in the rest of the Middle East (U.S. Library of Congress, 2011). It would also be interesting to examine the home environment as a correlate to obesity in a collectivist society, like Egypt, as studies have shown that cultures that value interdependence (collectivist) exhibit higher parental controls (authoritarian) and stressed obedience with respect to play and feeding than those that value independence (individualist) (Chao, 1994; Rudy & Grusec, 2006).

The theoretical basis of the study includes the various theories examined in the literature review, namely the SEM and its' application to obesity. The growing body of research on family and household impacts on obesity is also an important theoretical base of the study. Most importantly, Bryant.et al.'s (2008) development and application of the HHS and Gattshall et al.'s (2008) Model of Home Environment Influences on Childhood BMI are central in this investigation of the Egyptian home environment, forming the basis for the research question, plan and methodology. However, the studies on the home environment in the literature review, including Bryant's (2008) and Gattshall et al.'s (2008) respective studies, investigated the home environment in developed societies. It was thus needed to explore the Egyptian culture, especially the meals and PA habits of Egyptian children, as well as caregiver perceptions of obesity, diet and PA. This led to the formation of the four research questions that this study aimed to answer in examining and identifying the relationship between the home environment and obesity in urban Egyptian children aged 2-12. The four main questions this study aimed to answer were:

1. **Are there significant relationships between various home environment aspects and childhood overweight/obesity in Cairo, Egypt?**
2. **Is there a difference between home environments among socio-economic variables (SES areas and income) in Cairo, Egypt?**
3. **What are the maternal perceptions of obesity and PA in Egypt?**
4. **What are Egyptian children's diet and PA experiences and do these differ between SES areas?**

Questions 1 and 2 are primarily investigated using the HHS in Phase II (the quantitative phase) whereas question 3 and 4 were investigated in Phase III (the qualitative phase).

Chapter 3 Research Design

3.1 Chapter Overview

This chapter is an overview of the study design. This chapter discusses the methods used to answer the questions of the thesis, described in the earlier section. This chapter begins with a background section highlighting previous research on the home environment, particularly in Egypt. This is followed by a description of the aims and objectives of the study. Finally, the use of mixed methods in this study is discussed, together with the rationale behind doing so.

3.2 Background

Quantitative research on the prevalence of overweight and obesity has been carried out in Egypt on a national scale (El-Zanaty & Way, 2009; Aitsi-Selmi, Chandola, Friel, Sholkamy, & Marmot, 2009; WHO, 2010), in particular by the Egypt Demographic and Health Survey (EDHS) 2008 among both adolescents and adults. Despite this, home environment variables have not been comprehensively investigated in relation to childhood overweight/obesity prevalence in an Egyptian setting, making the quantitative phase of this study a pilot study in Egypt. Additionally, recent studies on perceptions and attitudes towards obesity, diet and physical activity (PA) in Egypt are scarce (Aboulfotouh, Soliman, Mansour, Farghaly, & El Dawaiaty, 2008; Ragab, 2007; El Derwi, El Shirbiny, & Atta, 2011). The qualitative phase, which examines parental perceptions of their children's weight, diet and PA, is thus a pilot study in Egypt.

Given the previously covered inverse relationship between increasing Body Mass Index (BMI) and productivity, as well as the current global economic crisis, these issues need to be examined as an attempt to avoid future health problems, costs and productivity decrease in both developing and developed economies. Furthermore, the impact of family structure, behaviour and environment on overweight and obesity rates, and the lack of study of family's impact in a family-centred collectivist culture such as Egypt, requires further investigation to determine whether there is a correlation between home variables and the increase in obesity in Egyptian society.

3.3 Aim and Study Questions

The aim of this study was to examine and identify the relationship between the home environment and obesity in urban Egyptian children aged 2-12, based on Gattshall et al.'s (2008) model of home environment influences on childhood BMI.

This study aimed to investigate home environment variables and their relationship to childhood weight status and socio-economic variables (SES area and income) as shown in the study's theoretical model (Fig 3.1). The main questions this study aimed to answer were:

1. ***Are there significant relationships between various home environment aspects and childhood overweight/obesity in Cairo, Egypt?***
2. ***Is there a difference between home environments among socio-economic variables (SES areas and income) in Cairo, Egypt?***
3. ***What are the maternal perceptions of obesity and PA in Egypt?***
4. ***What are Egyptian children's diet and PA experiences and do these differ between SES areas?***

Figure 3.1. Theoretical model of variables investigated in this study

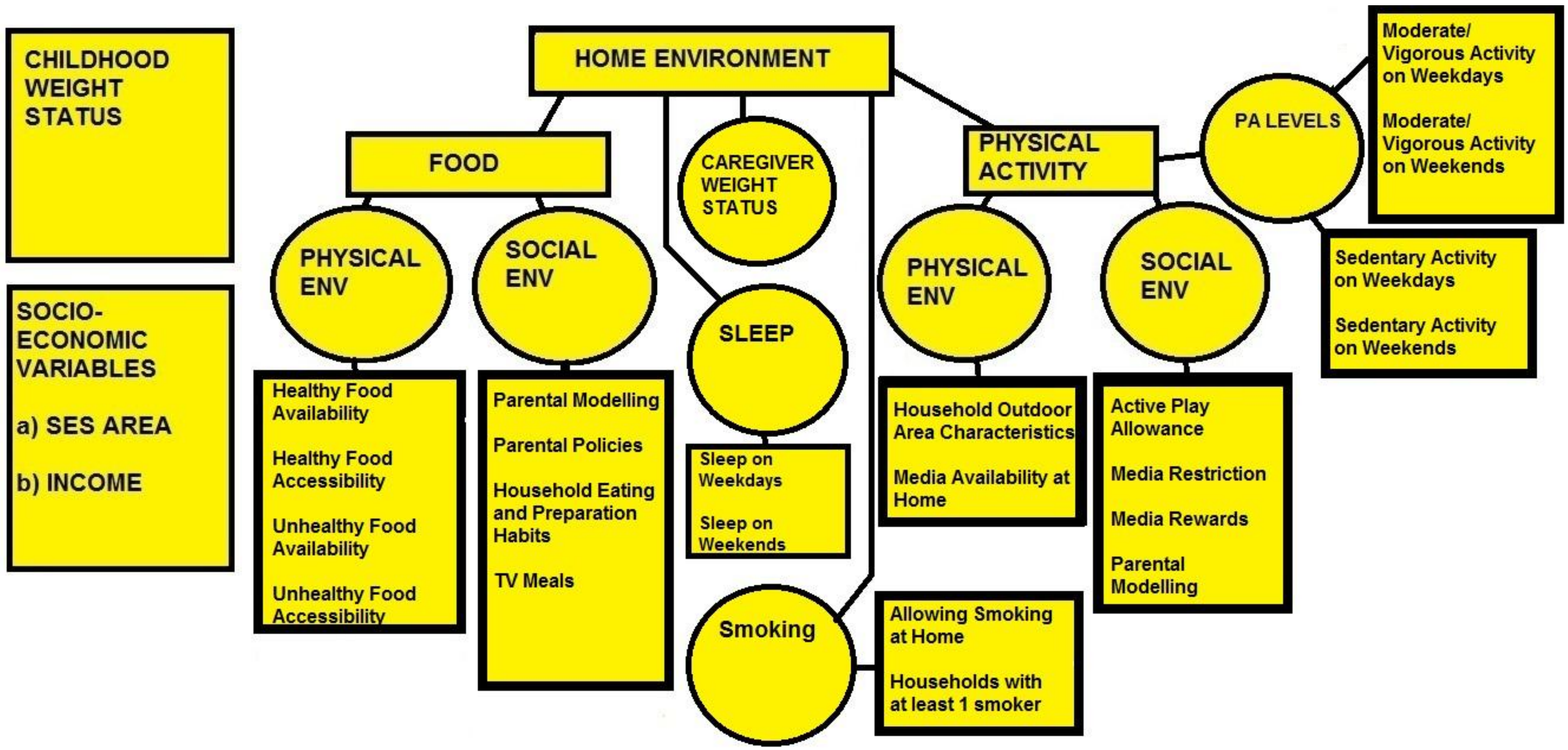


Figure 3.1 is a visual representation of the theoretical model used in this study. Developed by the author of this study, the model combined elements from both Bryant et al.'s (2008) HHS and Gattshall et al.'s (2008) Model of Home Environment Influences on Childhood BMI, which were discussed earlier in Chapter 2. The home environment in this plan is investigated by looking at five larger domains: food; PA; caregiver weight status; smoking and sleep. The study focuses primarily on the food and PA domains, dividing the former into physical and social environment sub-domains, and the latter into physical and social environment, adding to this a third sub-domain investigating children's PA and SA levels. These sub-domains are further divided into sub-sections, comprising the items in the quantitative survey adapted from Bryant et al.'s (2008) HHS. These domains, sub-domains and sub-sections are compared to three items, childhood BMI, Waist-to-Height Ratio (WtHR) and socio-economic variables (SES area and income). This theoretical model, its' component domains, sub-domains, sub-sections and questionnaire items are carefully dissected and discussed later in section 4.7 when describing the scoring procedure employed in this study's analysis.

The four questions of this study were investigated by means of a two phase mixed methods study, shown in table 3.1 below.

Table 3.1. Study Design

Study	Questions/aims addressed	Sample Description	Sampling method
Phase II Quantitative Study	Identifying significant relationships between various home environment variables and childhood overweight/obesity prevalence in Cairo, Egypt. Identifying differences between home environments among different SES variables (SES area and income) in Cairo.	210 households across 3 different SES areas - higher middle, lower middle and low – 70 households from each SES area. Participants in each household : primary female caregiver and reference child aged 2-12	Systematic sampling of households Random selection of reference child and caregiver within household
Phase III Qualitative Study	Describing maternal perceptions of obesity, diet and PA in Egyptian households, as well as investigating whether children's diet and PA experiences differ among SES areas	17 mothers/employees at a school in Cairo, Egypt	Purposive sampling in a secure school environment

Looking at Table 3.1., this study's methodology phases were inclusive of all the home environment variables mentioned in Gattshall's (2008) model. The quantitative study phase aimed at answering research questions 1 and 2. Using the HHS as a tool, this phase examined components of the food and PA home environment in the model. Both the physical and social environments pertaining to food and PA were included in the HHS. The HHS, despite its' examination of various aspects within the home environment (food availability and accessibility, sedentary vs. active behaviour, play behaviour), did not examine the setting or culture in which the survey was administered. The qualitative study phase of this thesis aimed at examining the home environment further by investigating Egyptian caregivers' (mothers') perceptions about obesity (their own obesity , their children's obesity, and obesity in Egyptian society), PA and diet, as well as household dietary habits (the foods they eat, how food is prepared) in different SES areas. Although the qualitative study investigated the physical food and PA environments, it mainly focused on the social environments of both, particularly parental policies, modelling and perceptions behind PA and food.

3.4 Study Design; Use of Mixed Methods

This study employed a mixed methods approach, combining both quantitative and qualitative methods. By employing both quantitative and qualitative elements, the study avoided the limitations of conducting either method alone, although combining both elements sometimes presents issues (for instance, how to assess similarity of findings from two very different approaches) (Sale, Lohfeld, & Brazil, 2002). Quantitative research alone fails to include the setting or the context in which the study is carried out, and thus restricts researcher's interpretation of data, whereby qualitative research alone and its associated bias makes the study difficult to apply to a larger group of people (Creswell & Plano Clark, 2007). Moreover, the mixed methods approach is advantageous in any public health practice or study as both qualitative and quantitative paradigms (the quantitative paradigm uses truthful empirical data while the qualitative paradigm relies on the view that reality is a constantly changing social construction) are unified in their goal to better the human condition, which is the main aim of public health research (Sale, Lohfeld, & Brazil, 2002). Moreover, mixed methods operate on the pragmatic paradigm which moves between both postpositivist (quantitative) and constructivist (qualitative) paradigms (Tashakkori & Teddlie, 2008).

Morgan (2008) highlights three characteristics/benefits of pragmatism. Firstly, while qualitative studies mainly rely on induction (moving from specific to general) and quantitative studies mainly on deduction (general to specific), pragmatism uses abductive reasoning, which moves back and forth between both – although qualitative research on its own could be interdisciplinary and join between both types of reasoning (for example, usage of inductive reasoning/analysis first followed by confirmation through deductive reasoning) (Patton, 2002; Denzin & Lincoln, 2005). Secondly, pragmatism relies on inter-subjectivity, which captures the polarity between quantitative objectivity and qualitative subjectivity. Thirdly, pragmatic mixed methods reasoning is transferable, meaning learning something from one method in a setting and then applying it to a different method and setting (Morgan, 2008). Mixing quantitative and qualitative methods is thus beneficial in health research because of the complexity involving the many different factors behind a health issue; and using one method alone is insufficient in a representation of any details and trends (Morgan, 1998; Ivankova, Creswell, & Stick, 2006). Additionally, mixed methods research in public health allows for a greater insight into public health issues through a combination of epidemiological and social science methods, even though results of mixed methods studies may be conflicting (Moffatt, White, Mackintosh, & Howel, 2006).

Mixed methods designs are used for a number of purposes, listed by Greene et al. (1989). These five purposes are triangulation (corresponding results of one or more methods), complementarity (clarification and illustration of one method's results through another), development (using the results of one study to develop the methodology of the next), initiation (seeking paradox and contradictions) and expansion (extending the range of inquiry through the use of different methods). This study's purpose is complementarity; it examined both the overlapping and different aspects of the home environment in relation to childhood overweight/obesity through clarifying the results of one method with another method (Greene, Caracelli, & Graham, 1989; Morgan, 1998). The rationale behind this is to increase the meaningfulness and interpretability, as well as the validity of both methods by using the method strengths and countering the biases of these methods (Greene, Caracelli, & Graham, 1989).

In this study, the two sets of data are treated as separate and enhance each other, and both taken together help create the bigger picture of the home environment as a determinant in childhood overweight/obesity (Brannen, 2005). The results of both the qualitative and quantitative methodologies in this study are investigated as complementary data sets rather than cross-triangulating or measuring one dataset against the other. This is due to the different views and paradigms underlying the quantitative and qualitative methodologies, as well as a difference in the problems investigated by both types of study (Moffatt, White, Mackintosh, & Howel, 2006). As mentioned previously, quantitative methodology is based on the postpositivist paradigm, which advocates a single reality separate from human perception and separate from the influence of the researcher, while qualitative methodology is based on the constructivist paradigm which advocates many realities based on interpretation (Sale, Lohfeld, & Brazil, 2002; Tashakkori & Teddlie, 2008).

These two paradigms have resulted in both methodologies evolving into two entirely different disciplines, with their own procedures, terminology and measures of validity, which would make verification of a set of data by a different type of data poor (Sale, Lohfeld, & Brazil, 2002). Additionally, Moffatt et al. (2006) state that the different datasets (and perhaps conflicting) results of quantitative and qualitative methodologies could be used to examine and scrutinise the methodologies used in one study more critically. In this study's case, the quantitative and qualitative components complement each other as they investigate both paradigms within the Egyptian home environment. The study would present an incomplete, inaccurate picture of the home environment if only one method was used. Quantitative data alone will display a numeric reality of childhood overweight/obesity prevalence and its' relation to the home environment in Egyptian households without taking into account the cultural aspects (eg. perceptions) involved. Alternatively, a qualitative study alone will not present factual evidence of overweight/obesity prevalence and will not present unbiased measurements of home environment variables. Conducting both methods, and allowing the two datasets to complete one another is an advantage of this pilot study, which aimed to present as complete a picture as possible of the Egyptian setting.

Five main decisions needed to be addressed when complementarity was employed in mixed methods design. These decisions were (1) the priority decision - which method is the principal method and which is the complementary one, (2) the sequence decision - which method precedes the other (3) the purpose the mixed methodology serves – triangulation, explanation or exploration (4) the stage at which multi-approach strategy happens and (5) whether one or two data sets are used (Morse, 1991; Morgan, 1998; Bryman, 2006).

Although both methods could be addressed with equal importance and at the same time, this presents several problems. If given the same importance, both require large data sets and require an equal depth of analysis, followed by a third attempt to connect the two studies and if done simultaneously, they are difficult to support and coordinate in terms of conducting and examining data, given the two methods operate on different timelines (Morgan, 1998). Using the Priority Sequence Model (Morse, 1991; Morgan, 1998), the study used a principal quantitative method, and then a follow-up qualitative method (QUANT-qual) to help evaluate and interpret the results, a method commonly used by survey administrators to expand on what has been learned from the analysis of the preliminary questionnaire. In this study, the main quantitative phase examined all aspects of the home food and PA environments – the physical and social environments of each outlined in Gattshall's (2008) model – by means of the HHS. The qualitative follow-up focused mainly on the social environments (particularly parental perception) of food, PA and obesity as well as focusing on the food physical environment through describing types of food eaten and how food is prepared in an Egyptian setting.

Therefore, this complementary mixed methods research employed the mixed method sequential explanatory design, which is defined as having two distinct phases; an initial quantitative phase followed by a qualitative phase (Ivankova, Creswell, & Stick, 2006; Creswell & Plano Clark, 2007). The rationale behind this is to display a general picture of home environment influences on childhood obesity in the quantitative phase, and to then interpret the quantitative data results by exploring the home environment and participant viewpoints in depth (Ivankova, Creswell, & Stick, 2006). The mixed methods sequential explanatory design's main benefits include its straightforwardness and the ability to further explore the quantitative data, while the drawbacks include a lengthy timeframe and feasibility of both studies (resources) (Ivankova, Creswell, & Stick, 2006). This study thus allowed for a large sample of people to be involved in the first quantitative phase (which could be used to infer correlations and can be applied to the larger community), and later allowing for a few participants to give detailed responses which adds depth and robustness to the data in the second phase (by means of qualitative semi-structured interviews). Two data sets were thus generated, the first being the HHS quantitative data, and the second being the recorded semi-structured interviews. Both data sets were simultaneously analysed and results from both were used to present the larger issue of home environment influences on childhood obesity. Both data sets were used to generate a larger, richer body than using either method. While the timeframe did not pose an issue in this study, a feasibility issue did arise, as the sample interviewed in the quantitative phase was unreachable for viewpoints in the second qualitative phase (after the Egyptian revolution). Tackling this issue is explained later in section 5.4.

The following two chapters will describe in detail the quantitative and qualitative phases of the study. The quantitative phase (Phase II) will be discussed critically in Chapter 4, including the methodology employed, the adoption and translation of the HHS and subsequent fieldwork and the scoring procedure of the survey. Chapter 4 also presents the descriptive findings from the HHS and the results of the statistical analyses employed in the research. Chapter 5 presents a similar critical discussion of Phase III (qualitative study), including the generation and application of the semi-structured interviews, as well as their transcription and analysis procedures, and also presents the findings of the qualitative study.

Chapter 4 Phase II Quantitative Study

4.1 Chapter Overview

This chapter is a critical review of Phase II, the quantitative study. This chapter begins with a description of how this phase tackles the aims and objectives of this study. This is followed by a critical discussion of the methodology employed, including the adoption, translation, modification of the HHS and the survey distribution methods employed in Cairo, Egypt. This is followed by a detailed description of the quantitative analysis of the surveys, detailing how each section and sub-section of the theoretical model of the study (Fig 3.1) was scored. The chapter presents the findings of the quantitative study, by reporting both resultant descriptive data, as well as the results of the various statistical analyses employed to examine relationships among the variables examined. Finally, the chapter presents a discussion of the findings, relating the results to previous studies as well as linking them to the qualitative phase.

4.2 Questions answered by the Quantitative Study

The first quantitative phase aimed to answer the first two questions in the aims and objectives of this study.

1. **Are there significant relationships between various home environment aspects and childhood overweight/obesity in Cairo, Egypt?**
2. **Is there a difference between home environments among socio-economic variables (SES areas and income) in Cairo, Egypt?**

This phase involved the use of a face-to-face survey instrument. A survey instrument is defined as a method of collecting data whereby standardised questionnaires or interviews are employed, according to the Office of Planning and Institutional Assessment (2006). Survey instruments have several features that distinguish them from other instruments: they collect new data concerning particular groups of people, they are fixed objective standardised methods which collect quantitative data for later statistical analysis, and finally conclusions from the analysed data are drawn with confidence limits and applied to the larger population (Mc Coll, et al., 2001). A survey instrument was essential for this study as (1) there is no previous data or theory concerning home environment influences on Egyptian children, and (2) in order to make inferences about the urban Egyptian population and present a clear picture of home environment influences on this population, a quantitative data set is imperative.

4.3 Choosing the Appropriate Data Collection Method

4.3.1 Use of Face to Face Surveys and the HHS

This study used face-to-face surveys as the data collection method as opposed to phone or mail surveys. Face to face surveys have several advantages, including a much higher response rate due to interpersonal communication, greater control concerning who responds/completes the questionnaire, and greater control in ensuring the questions are not misinterpreted or misunderstood (Mc Coll, et al., 2001; Dykema, Basson, & Schaeffer, 2008). Dykema et al. (2008) state that decisions about which type of survey to administer is dependent on how the questions should be conveyed to the respondent. Culturally, this consideration eliminated mail questionnaires, as this study involved administration to people in low SES households who may be less educated and illiterate, and may consequently not be able to complete a written questionnaire. Cental Intelligency Agency (CIA) fact book data revealed that 72% of the Egyptian population are literate, and that 63.5% of women are literate (2013). Moreover, there is a general reluctance and suspicion towards filling in surveys and sending to an unknown address among the Egyptian public, which eliminates telephone and mail surveys as effective options. Therefore, culturally, face-to-face administration ensured a higher response rate. The study also involved anthropometric measurements, and the most reliable way of taking these measurements is for the researcher to do so objectively in a face-to-face scenario. Moreover, a key driver behind the selection of face-to-face as the preferred methodology of this study in particular, was that it presented the best opportunity for the researcher to survey the subject of the study, the home environment in which the HHS was administered. Face to face surveys allowed the researcher to observe and interact with the homes involved and their immediate surroundings (streets, neighbourhood). The disadvantages of face-to-face are the nature of the method (time consuming, costly and needs to be short), the interviewee's behaviour (they might choose later responses due to memory, or may choose desirable responses to present themselves in a positive light), and the interviewer's behaviour and delivery (the interviewer's characteristics and biases may affect response rate or how the respondent would answer, and the interviewer's experience or expertise may affect recording of responses) (Mc Coll, et al., 2001; Dykema, Basson, & Schaeffer, 2008; Becker, 2011).

This study's main focus is on the relationship between the home environment and childhood obesity. When examining the tools used to measure the home environment (refer to section 2.8.7), the HOME-SF tool was omitted because it dealt with cognitive development as well as the home environment. It was difficult choosing between the HHS and the HES given the validity and reliability of both tools and their comprehensiveness. The CHES and more recent tools had not yet been developed during the survey distribution period (early 2010) thus the researcher was not able to choose them. However, it was decided to adopt the HHS, for practical reasons. The HES measures PA using accelerometers, much more objectively and accurately than the HHS, which relies on parental report. Although parent and proxy measures are less accurate with respect to objective measures of PA and sedentary activities (Robinson, Winiewicz, Fuerch, Roemmich, & Epstein, 2006), the availability and accessibility to accelerometers in the setting (Cairo) as well as the willingness of participants to use it during sampling led the HHS to be chosen.

4.3.2 Use of Intermediaries/Gatekeepers

This study involved the administration of surveys and anthropometric measurements collected from female primary caregivers and children aged 2-12. Given that interviewer characteristics may influence response rate, and given the main researcher is male, young, and inexperienced in an Egyptian context with respect to sampling (particularly in low SES areas), this may have negatively affected rates and participation of potential respondents. This is particularly important in Egypt (a predominantly Islamic culture), as a number of studies in Islamic cultures have shown that both genders prefer interactions with healthcare professionals of the same gender, as opposite sex members should avoid contact (namely physical) to avoid resulting impermissible relations (Tavakol, Rahemei-Madeseh, Torabi, & Goode, 2006; Padela & del Pozo, 2011). Therefore, it was necessary to contact a gatekeeper/intermediary to assist with and allow/facilitate data collection. Fisher and Vogel (2008) define intermediaries as actors involved in the process communicating research-based information to a particular social group. Moreover, the definition states that they capture and adapt the information to the context and then communicate the adapted product to the particular groups. Gatekeepers are defined as people who allow/deny access to a resource (person or object), and are used in health research often to protect vulnerable groups (in this study's case, women and children) (Holloway & Wheeler, 2003). Benefits of gatekeepers include their input in refining and offering advice, as well as facilitating access by raising cooperation of participants (Lee, 2005). The main disadvantages to this study are the lack of control in terms of the main researcher, as well as the inevitability of the intermediaries conducting/collecting the data differently to what the main researcher would do. These drawbacks however were overcome by closely liaising with and working very closely with the intermediary chosen, as well as being present in the data collection procedure and that the researcher being fluent in the target language with which the survey was administered.

The gatekeeper/intermediary contacted for assistance in data collection was El Zanaty & Associates, a research institute in Cairo, who were contacted prior to departure to Egypt. El Zanaty & Associates, founded by Professor Fatima El Zanaty (a professor at Cairo University) in 1995, specialises in conducting research on a wide range of issues and topics, including environment, water resources, and public health issues. El Zanaty & Associates are also responsible for the publication of the Egypt Demographic Health Survey (EDHS) with UNICEF, USAid and the Egyptian Ministry of Health, the latest one published in 2008, as well as projects for the Naval Medical Research Unit on Hepatitis prevalence in 2003, which involved household surveys. El Zanaty & Associates offered a paid service with guidance on preparing the survey for face validity (including translation into Arabic), as well as with data collection, through both their expertise and knowledge of the Egyptian population and provision of assistant researchers who were able to help with anthropometric measurements and survey collection. Since the HHS is aimed at primary caregivers who are mainly mothers in an Egyptian cultural setting and reference children, female research assistants (fieldwork coordinators) were needed to carry out the task due to the cultural and religious reasons discussed in the previous paragraph. Given these considerations, using trained female researchers is a procedure that was used by several other organisations in gathering data from an Egyptian sample. This was the only way this study would have been feasible; it is impossible to administer without the help of a competent Egyptian research agency. Three researchers from El Zanaty & Associates were enlisted to help with survey distribution, a male research supervisor, Mr Gamal, and two female researchers, Ms. Samia and Ms Rabab. These researchers have had much experience in data collection in an Egyptian setting. The author was accompanied by the three researchers to all three SES areas. The author's role was observatory, as he was not allowed to enter the households given the cultural restrictions in Egypt. Therefore, one of the female researchers entered the households, administered the HHS and anthropometric measures while the author waited outside the apartments. Mr Gamal, who supervised the researchers, acted as a chaperone to both female researchers while conducting the survey.

4.4 Adaption of Data Tool (Healthy Home Survey)

The Healthy Home Survey (HHS), was adapted for an Egyptian setting in the first quantitative phase. The rationale behind specifically using the HHS was that it is a reliable, valid tested tool (Bryant et al., 2008) which examines several aspects of the home environment, and that time constraints did not allow for the generation of a new instrument. However, the survey was modified to fit the Egyptian cultural setting. The HHS was administered face-to-face with primary caregivers about a reference child between the ages of 2-12.

The HHS was developed by researchers at the University of Leeds and the University of North Carolina, US (Bryant, et al., 2008) to investigate the impact of several aspects of the neighbourhood and home environment which are thought to play a role in healthy behaviours (diet/PA) in children. A sample of 85 adults with children aged 3-8 years in Chapel Hill, North Carolina (in the US) were recruited for the study. The survey was administered to parents through both telephone interviews and home visits to test reliability and validity. Analysis of results shows that the HHS was indeed a feasible, valid and reliable survey of home environment. Reliability and validity estimates differed among categories, but were high in general (0.22-1.00 and 0.007-0.96, respectively) (Bryant, et al., 2008).

The original questionnaire (see Appendix A) is divided into several sections, each representing a characteristic of the neighbourhood/home environment that has an impact on healthy weight behaviours in children. Among these characteristics were

1. **The general characteristics of the neighbourhood** (including the proximity of recreation centres and the presence of pavements),
2. **Health behaviours** practised by the members of the household (gym, weight loss, smoking),
3. **Sedentary behaviour** of the reference child during weekdays and weekends,
4. **Home environment issues:** the availability of different kinds of healthy and unhealthy food, as well as their accessibility to the reference child (between ages 2-12),
5. **Eating habits:** control of the reference child's diet, frequency of TV meals,
6. **Play:** the presence of a yard and wheeled toys, and parental control over the reference child's active and outdoor play, and
7. **Media usage:** The presence of TVs, video games and computers in the home and frequency of the reference child's use of each.

4.4.1 Modifications for Face Validity, Translation, Pretesting and Refining

Before administration in Egypt, face validity was addressed. Secolsky (1987) defined face validity as 'the suitability of the content of a test or items for an intended purpose as perceived by test takers, users and/or the general public' (p.82). The benefits of face validity include generating a better response from participants in terms of cooperation and motivation (Nevo, 1985; Secolsky, 1987). Moreover, checking for face validity allowed the researcher to make culturally appropriate changes to the survey before investing more time and money on survey administration. Testing for face validity was done carefully, as the study involved asking people who have little knowledge about the topic in question. Therefore, face validity was assessed through use of the public (by pre-testing) and use of the (gatekeeper) researchers' expertise throughout the study. Although the HHS was shown to be empirically valid and reliable, its application in Egypt needed to be valid to the Egyptian public. The questionnaire was modified from the original used by Bryant et al. (2008) to ensure validity for the cultural setting of this research (for the modified version of the HHS, in English, refer to Appendix B). This was achieved through translation into Arabic with trained researchers at El Zanaty & Associates, and also through a pre-test period to test efficacy of the translated HHS among the public to which the HHS is targeted. Ten pre-test surveys were handed out to respondents during this time period across various SES areas in the urban Greater Cairo area by El Zanaty & Associates. Translation and pre-testing processes are detailed in section 4.4.2.

4.4.2 Translation into Arabic & Pre-testing

Meetings with Prof. El Zanaty and research assistants began in early January 2010 in Cairo. During several sessions over the course of two weeks, the survey questions were reviewed in detail with the fieldwork researchers to ensure face validity. These meetings mainly involved translation of the HHS into Arabic. According to Harkness & Schoua-Glosberg (1998), the most obvious reason for translation is to field a scientific research instrument that is not available in the target culture's language (in this case Arabic, the official language in Egypt). Translation is a difficult process, as a well- translated instrument in cross-cultural research needs to display three types of equivalence: semantic (equivalence in words and sentences), conceptual (equivalence in the concepts being discussed) and normative (the capacity to address social norms in a particular culture) (Centre for Aging in Diverse Communities, 2007).

Several issues were considered before translating. The researcher acknowledged that the difference between languages means that translation can never result in a tool that is identical in the target language to the original language version (Harkness & Schoua-Glosberg, 1998; Hunt & Bhopal, 2004). As this study dealt with an already existing tool, also one that was designed with a particular target culture, the researcher was faced with two issues. Firstly, the original HHS needed to be examined to see whether it was deeply rooted with respect to an American/English audience and modified to reflect Egyptian culture and the Arabic language. Moreover, sometimes existing surveys may have questions that seem ambiguous, and therefore these questions could be left ambiguous in the translation or translated with a single clear interpretation (Harkness, Pennell, & Schoua-Glusberg, 2004). Both issues were tackled similar to Hunt & Bhopal's (2004) recommendation of both consultations and field testing measures within a monolingual culture for face validity.

Firstly, the three researchers at El Zanaty & Associates were consulted, and along with the main researcher, employed parallel translation of the HHS. Parallel translation is a type of translation method involving research tools, wherein a few competent researchers in the target language make independent translations of a research tool and in a revision meeting, reconcile their differences and ultimately decide on the best, most appropriate translation (Harkness & Schoua-Glosberg, 1998). Parallel translation is beneficial as it brings together several experienced researchers and allows for greater input into the translation, although the process is time consuming and costly. Moreover, Harkness and Shcoua-Glousberg (1998) state that this type of translation should be dealt with great care, as sometimes questions/items are interpreted subjectively (a drawback of group dynamics) and at other times researchers may come up with equally effective translations which may prove difficult to choose between. In this study, the researchers at El Zanaty & Associates were extremely competent in the Arabic language, as they are Egyptian and have also administered many questionnaires in an Egyptian setting, thus having a background of how questions will be interpreted. Prior to the independent translations, the researchers were given a copy of the original HHS and were informed about each question and what each question meant. The reconciliatory meeting occurred a week later, whereby all researchers brought together their various interpretations of each item in the questionnaire.

Following this, the pre-tests were conducted. This took place in early February 2010, after the initial translation meetings with researchers at El Zanaty & Associates. Four pre-tests were taken in Matariya, a low SES area, one was taken in Masr El Gedida, a middle class area. The rest of the surveys were conducted in low SES areas; two in the Faisal area , two in the Shobra area, and one in the Darb El Ahmar area in Central Cairo. The pre-tests were aimed at low SES areas in particular to administer the test survey to Egyptians most likely to be monolingual (usually people from low SES areas with little or no education). During the pre-tests, participants were asked whether they understood the question or not. Later, the researchers tried to find similarities between their own and the respondents' perceptions of the questions asked. Following the pre-tests, another reconciliatory meeting took place to discuss perception of the respondents to the survey items. The pre-tests resulted in the modification of some items, which are described in detail in Appendix C.

4.5 Selection & Sampling Technique

Since the HHS was initially conducted through telephone interviews followed by home visitation based on parental response to an advertisement (Bryant, et al., 2008), a new survey sample selection technique had to be decided upon within an Egyptian setting, which took into account the socio-economic aspects of households in order to accurately present them. In this study, it was decided to use two socio-economic variables: SES area and income. The study's selection technique relied primarily on the former, as the study is looking at the home environment. Numerous public health studies (Krieger, et al., 2002; Brennan, Henry, Nicholson, Kotowicz, & Pasco, 2009; Menec, Shosshtari, Nowicki, & Fournier, 2010; Hearst, et al., 2013) have examined area-based socio-economic variables alongside personal socio-economic variables such as income, wealth and education offering robustness to the study -

neighbourhood differences have been found to show relationships with aspects of health. Moreover, since this study is in an entirely new setting, it would not only be robust to include both a personal and an area-based socio-economic variable (income and SES area, respectively), but it will also reveal which variable better highlights differences in the home environment and in childhood obesity.

Since the study examined primary caregivers and children, and also examined SES differences between households in Cairo, three selection aspects were considered by the main researcher and the researchers at El-Zanaty & Associates: selection of the SES areas, selection of the households within the SES areas, and finally selection of the reference child and caregiver in the household.

4.5.1 Selection of SES areas

Selection of SES areas was implemented by using the 2006 index provided to the research agency by CAPMAS. This is the index used by El Zanaty & Associates in any Egyptian study. This index divides Egypt into governorates (the equivalent of English counties). Each governorate has several districts (called kisms). The Greater Cairo area is located in two governorates, Cairo and Giza. Since data collection only took place in the Greater Cairo area (as the study focuses on children and mother in urban areas), the only governorate used for pre-tests and sampling was the Cairo Governorate – that is the city of Cairo east of the Nile River. Cairo itself is divided into numerous districts called kisms, which are used by research agencies (such as El Zanaty & Associates) for identifying socio economic status, as each kism is known (among all residents of Cairo, not just research agencies) to house people of certain socio-economic levels. It was decided that 210 households would be chosen from three SES areas, 70 from each SES area. This was decided due to pragmatic time constraints reasons – including the research assistance times and the duration of the main researcher's stay in Egypt. These numbers were also chosen to allow for an adequate number of participants for between group analyses (fifty per group at least) (Green, 1991; VanVoorhis & Morgan, 2007).

The three SES areas chosen for survey distribution cover a sample of the SES groups living in urban Cairo, from very low SES groups to higher middle SES groups. The first area chosen was the Matariya area, identified as a low SES residential area. The second was the Hada'iq Al Qoba area, known as a lower middle SES residential area. The third is Madinet Nasr, a middle/higher middle SES residential area (El Zanaty & Associates, 2010). These areas were chosen as they were the same areas in Cairo employed by El Zanaty for previous studies on such areas, and these areas were the most representative of their respective SES groups within the Cairo governorate area of greater Metropolitan Cairo area. Moreover, these areas were the most representative of the SES areas in Cairo mentioned in the literature review (Sims, Sejoume, & El Shorbagi, 2003; Denis, 2006).

The study intended to reach the very high SES groups as well, but they live outside the Cairo Metropolitan Region in special residential compounds which are out of reach. These compounds, built in the 1990's and 2000's are modern and more recently fully sustainable, which eliminates their inhabitants' need to go to the city, and are gated and heavily guarded (Denis, 2006; El Zanaty, Ismail, & Abdel Rahman, 2010). Due to the security, reaching these groups could only be achieved on a personal level/arrangement. It could have been done, but doing so would not be random, and the methodology would have been compromised. It was thus recommended, by both the research agency and previous personal knowledge of the Egyptian setting, to concentrate on groups living in urban Cairo. The main disadvantage of this choice was the exclusion of the highest SES area. Whilst this means the study was unable to compare lower SES groups with the highest SES group in the country, the sample chosen did include the middle and low classes who reside mainly in the inner city.

4.5.2 Systematic Selection of Households within the SES area

El Zanaty & Associates advised selection had to be carried out without street choice, as some of the neighbourhoods entered have no distinct street labels. It was advised that households were selected in every four streets/alleys walked through by the main researcher and the assistant researchers in accordance with systematic sampling. When a household was systematically chosen, and these households are usually apartment buildings in Cairo, the researchers would knock on the first apartment door in the building. If anyone responded, it was decided that a filter question should be included. These included whether the household had a child between the ages of 2-12 (in the case of more than one child in the age bracket present, the child was chosen randomly, explained in the next section). Limitations of this method (which may interfere with the random nature of the survey application) was that if no one was at home, they would not be included in the study, whereas probability or random/probability sampling requires that all members of the population have an equal chance of being selected (Fink, 2006). If no one responds, the next apartment in the building was chosen.

4.5.3 Random Sampling of Reference Child and Caregiver

The age range of eligible children for the study (Bryant et al.'s (2008) original survey defined eligible children as those aged 2-8 years old) was modified after meeting with Prof. El Zanaty and researchers. The age range chosen was changed from 2-8 years old to 2-12 years old. The choice of age 12 as the maximum eligible age was due to a cultural reason linked to socio-economic and educational reasons; according to the 2008 EDHS, primary education in Egypt (consisting of three primary years and three preparatory years) is mandatory and starts at age 6. Secondary education, which starts at age 12, is not mandatory. UNICEF Egypt (2005) states that 8.1% of 6-18 year old children have dropped out of school-mainly related to low SES and need to work, and the 2008 EDHS revealed that dropping out occurred mainly in secondary education (after age 12) (El-Zanaty & Way, 2009). UNICEF's estimates of 2007 -2010 also confirmed this, showing 66% of secondary school enrolment in males and 64% enrolment in females (UNICEF, 2013). When Egyptian children begin to work, the influence of the home is reduced due to long hours outside the home coupled with different eating habits. Consequently, primary caregivers (particularly in lower SES areas) may fail to respond to many questions concerning the child's PA and eating habits as they do not know what their children engage in during work hours. Although this also applies to school times, school children in Egypt (mainly primary schoolchildren till age 12) have a greater interaction and dependency on the home environment (El Zanaty, Ismail, & Abdel Rahman, 2010). The minimum age (2 years) was chosen in accordance with the original HHS and also because anthropometric data concerning overweight and obesity in children begins at age two.

Random selection of the reference child (and consequently the primary caregiver) was also decided with the researchers at El Zanaty & Associates. This was to reduce bias, as the original plan prior to departure was to choose the eldest child, which would have yielded a sample of reference children mainly in their late childhood years. This was also due to the researchers mentioning that numerous Egyptian households they have visited have an extended family arrangement (for example, two brothers and their families in the same flat). This random sampling technique is used by the agency in many studies (El Zanaty, Ismail, & Abdel Rahman, 2010), most notably in the EDHS, which used the same selection procedure (El-Zanaty & Way, 2009).

El Zanaty & Associates' random selection technique (of the children to be included in the study) involved the use of the household identification number, found on the top right corner of the title page of each survey (see Appendix B). The random procedure, which employed a random number table, followed these steps:

1. The names and details of all household members were placed in the table on page 3 of the modified survey. Each row/line corresponds to a number from 1-10 (written on the left hand side). Each family member thus becomes defined by the line number of the row in which (s)he was placed.
2. On page 4 is a second (random number) table. In the left hand column of this table, the numbers 1 to 10 are already printed. These represent the line numbers given to all family members in the previous table (Step 1). The line numbers corresponding to all children between the ages of 2-12 are circled here. In the right column of this table,

the line number of each eligible child's primary caregiver is recorded by the researcher.

3. The total number of eligible children is filled in at the lowermost box on the second table (on page 4).
4. The third (and final) table on page 5 determines which eligible child will be the reference child.

   The columns of the table (numbered 1 to 8) represent the total number of eligible children in the household (calculated in Step 3). The total number of eligible children is circled here.

   The rows (numbered 0 to 9) represent the last digit of the household identification number (located on both the upper right corner of the title page). The number corresponding to the last digit of the household identification number is circled. This household number was the number of the household sampled chronologically (the first household being 001 and the last household sampled being 210).

   The reference child was chosen by locating the number in the box that corresponds to both circled numbers. The number in this box is the line number of one of the reference children; the one who is randomly chosen to be the reference child.
5. The primary caregiver was chosen by referring to the second table (on page 4/Step 2). The primary caregiver who is interviewed is the primary caregiver of the reference child chosen. The line number on the right hand side of the table indicated the line number of the primary caregiver.

The random selection technique employed by El Zanaty & Associates was advantageous given it provided every child in the appropriate age group in the household an equal chance of being selected as the subject of the study. Furthermore, in a household where more than one female caregiver lived (an extended family situation), all the caregivers had a chance (although not equal depending on number of children) of being chosen as the subject alongside their children. In the case of the chosen child being absent, the household was revisited at a later time when the child was present, as anthropometric measures were needed from the children. This issue led the researchers carry out sampling in the afternoons when children and caregivers were more likely to be at home.

4.6 Conducting Data Collection

4.6.1 Healthy Home Survey Distribution

Ethical approval for the survey (REPN09/166 – see Appendix D) was received on the 9th of February 2010 from the University of Salford. Checks were made to ensure ethical issues in Egypt such as child protection were being followed although procedures are very different in each country regarding research access. Survey distribution started in late February 2010 and continued through the end of April.

Although the author and the male researcher were present throughout the data collection method, the surveys were carried out by the two female researchers, Ms. Rabab and Ms. Samia. In many cases, only the female researchers were allowed into the household by the primary caregiver. Response by primary caregivers was overwhelmingly positive in terms of taking part; very few caregivers approached and who were eligible for the study refused to take part (n = 8). This is partly due to the field experience of the research assistants, who are quite experienced dealing with the Egyptian population, and without whom the study would have been very hard to conduct, particularly in the low SES area. In fact, only one respondent out of the 210 phoned to inquire about the study and the information collected after the survey was conducted. The desired number of respondents was achieved. Moreover, when the random selection procedure of the reference child and primary caregiver was conducted, 65 of the reference children selected were not at home, they were thus visited later. Many were re-visited later in the day when the children were available – in mid-afternoon, after school hours for some children. This was not an issue with caregivers, as they were present in the household if someone answered the door. In fact, caregivers were the members who answered the doorbell/knock during most visits. Finding both caregiver and child at the time proved quite successful; only one child was unattainable for anthropometric measurements after two visits.

With respect to inter-observer reliability between the female researchers, the questionnaire did not allow for variations between researchers. The HHS questions (Likert Scale and Y/N questions) did not allow for researcher inter-observer differences, relying on the respondent for a specific answer. The only question which required the researcher's input was the presence of fruit in the living area. For this question, researchers were instructed to only answer 'yes' if they sighted a fruit bowl in the reception/living room where they are greeted.

4.6.2 Anthropometric Measurements & Calculation

The anthropometric measures taken in this study's data collection stage were: weight (kg), height (m) (both were used for BMI - kg/m^2 - calculation), and waist circumference (WC) (cm) measurements (used to calculate WtHR) in both children and primary caregivers. All measurements were taken once. Height (m) was measured using a calibrated, portable standing stadiometer, and weight (kg) was measured with the calibrated portable weighing scales provided by El Zanaty & Associates. In adults, waist circumference was measured according to WHO standards (2008), at the minimal waist point. WC in children was measured 4cm above the umbilicus, which has been recommended in measurement of children (Rudolf, Walker, & Cole, 2007). Measurements were taken over thin clothing, no removal of clothing would be necessary, and were taken by the female research assistants at all times in accordance with cultural norms.

One of the main disadvantages of anthropometry lies in the potential for inaccuracies when measuring (World Bank, 2013), and in this study, location of the umbilicus, minimal waist point and hip point measurements were taken over thin clothing. Moreover, if surfaces at home were uneven, this posed a problem when weighing and measuring height. Children were asked to pinpoint their umbilicus for measurement if it was not easily identifiable, and with respect to obese women, the female research assistants tried to accurately assess the minimal waist point for measurement. Moreover, there is the inevitability of measurement errors, which increase in cases like this study where several data collectors are involved, increasing inter-observer measurement error (Ulijaszek & Kerr, 1999; Himes, 2009). Although Himes (2009) advocates measurement of the individual by different researchers to reduce this error, this was quite difficult in this study due to the researchers' time constraints, as well as the timeframe of this study. Moreover, instrument error/inaccuracy by the use of stadiometers - and the potential failure to calibrate them – may also impact results by overestimation of overweight and obesity (Ulijaszek & Kerr, 1999; Biehl, et al., 2013).

Analysis included BMI, reported in kg/m^2, and WtHR for adults, and the derivation of BMI Z-scores and WtHR for children. The researcher acknowledges that BMI as a measurement of obesity is a much debated issue. Whereas some studies recommend BMI as an accurate indicator of overweight and obesity in children and adolescents (Himes & Dietz, 1994; Barlow & Dietz, 1998; Krebs, et al., 2007; Himes, 2009; Reilly, et al., 2010; Faculty of Public Health, 2010), other studies have suggested that BMI may not be as accurate in predicting excess fat in both adults and children (Romero-Corral, et al., 2008; Freedman & Sherry, 2009). Some advocate that Waist-to-Hip Ratio (WHR), and mostly WC as better measures of visceral obesity, fat distribution and prediction of risk factors (including obesity) in adults and children (Maffeis, Pietrobelli, Grezzani, Provera, & Tatò, 2001; de Koning, Merchant, Pogue, & Anand, 2007; Ketel, et al., 2007; Taylor, et al., 2008; Bosy-Westphal, et al., 2010). However, very recent studies have found that WtHR is a much better indicator of obesity, adiposity and its' associated risks in children (Brambilla, Bedogni, Heo, & Pietrobelli, 2013; Khoury, Manlhiot, & McCrindle, 2013). Therefore, the researcher aimed to use two measures (BMI and WtHR), to add robustness to the study and to avoid the limitations of using just one anthropometric measure.

BMI Z-scores are defined as the deviation of a child's BMI percentile from the mean BMI percentile of the child's exact age and sex in the population (Moore, 2010). Children's weight status was calculated by the derivation of BMI Z-scores using the British 1990 Growth Reference. This reference, known as UK90, is a compilation of results from several studies in the UK between 1978 and 1994 (NOO, 2011). A BMI Z-score reference equivalent for Egypt was unavailable. BMI Z-scores were calculated for children by first calculating BMI – dividing the child's weight (kg) by their height squared (m^2). The child's BMI, date of anthropometric measurement (dd/mm/yyyy), birthday (dd/mm/yyyy) and gender were then entered into the LMS Growth computer software, which contains data from the British 1990 Growth Reference and generates each child's Z-score (Harlow Healthcare, 2013). The LMS software adheres to the LMS method, which describes the BMI according to age and sex using the median (M(t)), coefficient of variation (S(t)) and skewness according to the Box Cox Power (L(t)) (Cole, Freeman, & Preece, 1995) and finds an SD score (a Z-score) using the equation :

$$\text{SD Score: } \frac{[BMI/M(t)]^{(L(t))} - 1}{L(t)\,S(t)}$$

Although continuous BMI Z-scores were used in the analyses, they were grouped into pre-set categories used by the World Health Organisation (WHO) for descriptive sections, whereby a Z-score of 0.99 or below indicated healthy/underweight, and a Z-score of 1 and above indicated overweight/obesity (WHO, 2008; Wang & Chen, 2012). These WHO cut-offs were used because no similar cut-off data exists for Egypt, in addition to the WHO cut-offs being based on the international MGRS which measured children from various ethnic and cultural backgrounds (including the Middle East) (WHO, 2012). Data were divided into these two categories based on the numbers of healthy weight/underweight and overweight/obese children in the study results.

Caregiver weight status (BMI) was calculated by dividing the weight (kg) by height (m^2), and comparing with the WHO BMI classification system for adults, wherein a BMI under 18.5 kg/m^2 is underweight, a BMI of 18.5-24.9kg/m^2 is healthy, a BMI of 25-29.9kg/m^2 is overweight, a BMI of 30-39.9kg/m^2 is obese, and a BMI of 40kg/m^2 + is morbidly obese (NOO, 2010). Numerous studies have identified parental obesity as one of the most significant predictors of childhood obesity (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997; Strauss & Knight, 1999; Foresight, 2007; NICE, 2006; Davis, McGonagle, Schonei, & Stafford, 2008).

Waist-to-Height Ratio is an anthropometric measure of excessive central adiposity in children, a ratio measured by dividing the waist (cm) by height (cm). A WtHR cut-off of 0.5 or above is an effective predictor of cardiometabolic risk regardless of age, gender or ethnicity (Ashwell & Hsieh, 2005; Browning, Hsieh, & Ashwell, 2010; Graves, et al., 2013). WtHR was used for this study, and was beneficial especially since the studies reported the cut-off to be similar across ethnicities. Both adult and child WtHRs were calculated by dividing the waist (in cm) by height (in cm).

4.7 Quantitative Data Analysis

Data were entered into the SPSS 16 Statistical Software programme. The SPSS was chosen as it is a widely used research tool, offers a wide range of parametric and non-parametric tests for data analysis, and is also quite compatible with data imported from other widely used programmes, namely Excel (Pallant, 2007; University of Sheffield, 2012). SPSS also simplifies the process of complex analyses, eliminating the need for command syntax (Pensiero, 2009). The main limitation of SPSS is the large output of irrelevant data, which makes it hard sometimes to derive the essentials without the use of an SPSS manual (Hyndman, 2002; Pallant, 2007). Moreover, SPSS is also time consuming, particularly when converting and coding numbers in the variable windows (University of Sheffield, 2012) Additionally, mistakes may be made by the researcher when entering data on to SPSS, particularly when translating from another language. The data entered were double checked throughout the analysis process by re-checking with the survey data. Following this, frequency charts were generated in SPSS for all variables to check outliers to verify if they are accurate entries. Any inaccuracies were revised and changed according to the written surveys.

Since no scoring framework was available for the existing HHS, a scoring method was devised for this study. The questions in the HHS were grouped into categories, sub-categories and sub-domains according to the theoretical model of the study (Fig 3.1), which was based on both the HHS and Gattshall's model of PA and Food Home Environment Influences. The generation of categories, scoring and the rationale behind the processes is explained in the following sections and Table 4.1; both break down the study's theoretical model into its' various components.

To address research question 1, chi-square test for independence was first employed to examine relationships between each categorised question item and categorised (binary) childhood BMI and WtHR in order to find statistically significant differences between these catgeories. Consequently, correlation analyses were employed to examine the strength and direction of the relationships between sub-domain scores (continuous) and continuous childhood BMI and WtHR measures. Prior to correlation analyses, all scores were checked for normality. Pearson's correlation was used for normally distributed histograms, while Spearman's was used for histograms that were not normally distributed. Finally, multiple linear regression analyses were then run to examine the strength of those home environment aspects that were significantly correlated with either BMI Z-score or WtHR, adjusting for child age and gender. Normally distributed scores were subjected to regression as continuous variables, while scores that weren't normally distributed were analysed as binary categorical variables.

Question 2 examined the differences between home environments with respect to the categorical socio-economic variables (SES area/income). Since sub-domain scores were continuous and SES area and income were recorded as categorical variables, ANOVA or Kruksall-Wallis were employed depending on the distribution of each score. Normally distributed sub-domain scores were subjected to parametric tests (ANOVA), while skewed distributions were subjected to non-parametric tests (Kruksall-Wallis).

Table 4.1. HHS scoring technique

Category	Sub-categories	Sub-domains	Scoring/ Categorising
Caregiver BMI (kg/m²) (see p.111, p.104-7)			BMI ≥ 30 = obese , BMI < 30 = non-obese
Child BMI Z-Score (see p. 104-7)			BMI Z-score ≥ 1 = overweight/obese BMI Z-score < 1 = healthy/underweight
WtHR (Caregiver & Child) (see p.104-7)			WtHR < 0.5 = healthy , WtHR ≥ 0.5 = at risk
Sleep on weekdays (see p.111-2)			Sleep < 10 hrs/Sleep ≥ 10 hrs
Sleep on weekends (see p.111-2)			Sleep < 10 hrs/Sleep ≥ 10 hrs
Smoking Score (see p.112)			Allowing smoking at home + Households with at least 1 smoker
Moderate & Vigorous activity (see p.113-4)			Moving and dancing to music + Active play (min)
Sedentary Activity (see p.113-4)			TV + Computer/videogames + Light activity (min)
Home Food Environ-ment	**Physical Environment (see p.115-7)**	Healthy Food Availability (g)	Fresh fruit + fresh vegetables + canned/jarred fruit + frozen vegetables (g/day/number of people per household)
		Unhealthy Food Availability (g)	Salty snacks + sweet snacks + candy/chocolate + soda (g/day/number of people per household)
		Healthy Food Accessibility	Access to fresh fruit ***(1)*** + Access to fresh veg ***(1)*** + Fresh fruit visible in living room ***(1)***
		Unhealthy Food Accessibility	Access to salty snacks ***(2)*** + Access to sweet snacks ***(2)*** + Access to candy/chocolate ***(2)*** + Access to soda ***(2)***
	Social Environment (see p. 118-21)	Parental Food Modelling	Avoiding eating sweets in the presence of the child ***(3)*** + Frequency of eating healthily in the presence of the child ***(3)***
		Parental Food Policies	Asking the child to eat everything on his/her plate ***(4)*** + Restriction of child's dessert if they have not finished their main course ***(4)*** + Rewarding the child with food when plate is finished ***(4)*** + Restricting child's meals to set times ***(3)*** + Portions caregiver serves child in comparison to their own portions ***(9)***
		Eating Habits and Preparation	Having adequate space in the kitchen for food preparation ***(1)*** + Frequency of meals at extended family members' homes ***(5)*** + Frequency of children

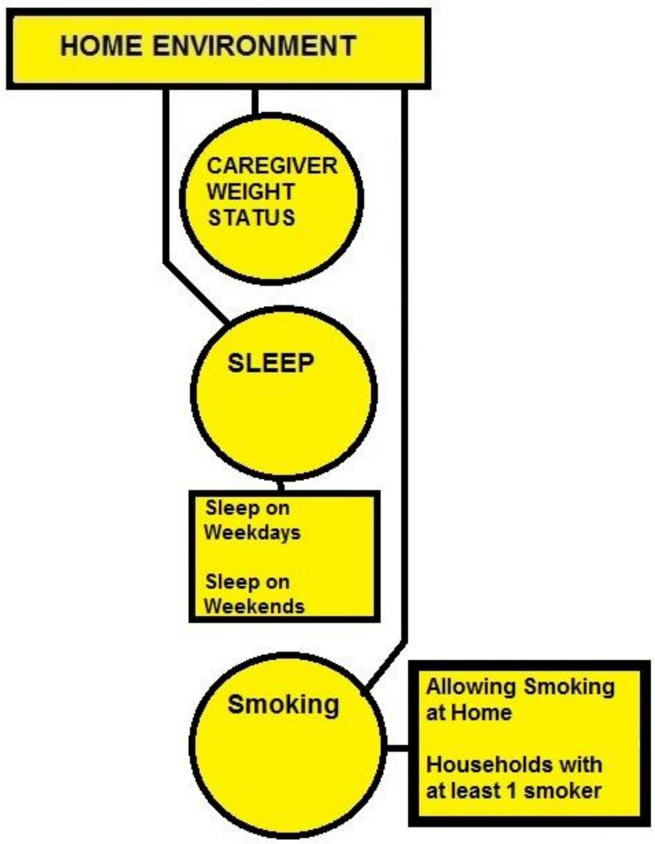
			having breakfasts at home ***(6)*** + Frequency of children having breakfasts at school ***(7)*** + Frequency of family having dinners together ***(6)***
		TV Meals	TV breakfasts ***(7)*** + TV lunches ***(7)*** + TV dinners ***(7)*** + TV snacks ***(7)*** + TV visible from dining room ***(2)***
Home PA Environ-ment	**Physical Environment (see p.122-3)**	Household Outdoor Area Characteristics	Sidewalk presence ***(1)*** + Location of home on a busy street ***(1)*** + Proximity to recreational facilities ***(1)*** + Proximity to gym/sporting centres ***(1)*** + Presence of a yard (hosh) ***(1)*** + Yard size ***(10)*** + Having a private/shared yard with another building ***(11)*** + Presence of play equipment in the yard/ hosh ***(1)*** + Ownership of : bicycles ***(1)*** , Tricycles ***(1)*** , Scooters ***(1)*** + Other wheeled toys ***(1)***
		Media Availability at Home	Television ***(1)*** + Television in child's room ***(2)*** + Computer/laptop ***(1)*** + Computer/laptop in child's room ***(1)*** + Videogame consoles ***(1)*** + Videogame consoles in child's room ***(1)*** + Cable/satellite ***(1)*** + DVD/Video player ***(1)*** + Children's videotapes/DVDs ***(1)***
	Social Environment (see p.124-6)	Active Play Allowance	Restriction of active play : indoors ***(4)*** + In the yard ***(4)*** + In the immediate neighbourhood ***(4)*** + Frequency of extended family members allowing outdoor play when child was entrusted to them ***(3)***
		Parental Modelling	Engagement in physical exercise ***(3)*** + Frequency of being active in the presence of the child ***(3)*** + At least one gym member ***(1)***
		Media Restrictions	Frequency of : TV restriction ***(7)*** + Videogames restriction ***(7)*** + Computer/laptop restriction ***(7)***
		Media Rewards	Frequency of : TV rewards ***(7)*** + Videogames rewards ***(7)*** + Computer/laptop rewards ***(7)***

Scoring Key (Italicized numbers adjacent to each item above)	
(1)	***Yes = 1 No = 0***
(2)	***Yes = 0 No = 1***
(3)	***Always = 4, Mostly = 3, Sometimes = 2, Rarely = 1, Never = 0***
(4)	***Always = 0, Mostly = 1, Sometimes = 2, Rarely = 3, Never = 4***
(5)	***Several times a week = 0, Once weekly = 1, Once a fortnight = 2, Once monthly = 3, On occasions/holiday = 4, Once yearly = 5, Rarely = 6***
(6)	***0 days = 0, 1 day= 1, 2 days = 2, 3 days = 3, 4 days = 4, 5 days = 5, 6 days = 6, 7 days = 7***
(7)	***0 days = 7, 1 day = 6, 2 days = 5, 3 days = 4, 4 days = 3, 5 days = 2, 6 days = 1, 7 days = 0***
(8)	***Always = 0, Mostly = 1, Sometimes = 2, Rarely = 1, Never = 0***
(9)	***More than = 0, same amount = 1, less than = 2***
(10)	***Small = 0, Medium = 1, Large = 2***

Table 4.1 presents the HHS scoring technique implemented by the researcher throughout data analysis. An explanation of each category/sub-item and a detailed explanation of the coding schemes (the contents of the key in table 4.1) and the rationale behind each are explained in detail in the following sections.

4.7.1 Weight Status, Sleep and Smoking

Figure 4.1. Weight status, Sleep and Smoking



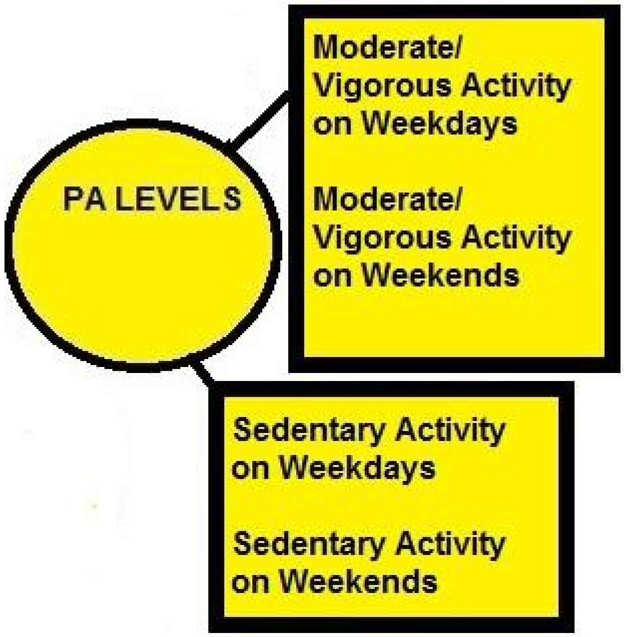
Caregiver weight status, sleep and smoking were three separate, major aspects examined with respect to childhood obesity in this study (Fig 4.1). With respect to caregiver weight status, the derivation and rational behind the use of adult BMI and child BMI Z-scores were described in detail in section 4.6.2.

The questionnaire investigated children's average sleeping durations on weekdays and weekends. **Sleep on Weekdays** (minutes) was recorded initially in the survey. **Sleep on Weekends** (in minutes) was calculated as an average of both Friday and Saturday average sleeping hours. Both weekday and weekend sleep were tested to establish whether a correlation exists with respect to childhood BMI Z-scores. Recent studies suggest that a lack of/lesser sleep in children is a risk factor for obesity (Chen, Beydoun, & Wang, 2008; Must & Parisi, 2009; Bell & Zimmerman, 2010).

Allowing smoking at home was scored 0 (unhealthy) while households that did not allow smoking were scored 1 (healthy). **Households with at least one smoker** were given a 0 score, while households without any smokers were given a 1. Both scores were added to generate a **smoking score.** Although the relationship between smoking and obesity is complex, whereby some findings suggest it decreases appetite and thus body weight, and other findings indicate a positive relationship between smoking and obesity (Chiolero, Faeh, Paccaud, & Cornuz, 2008; Kwon, et al., 2010; Patel, et al., 2011), smoking was still regarded in this study as an unhealthy factor which may contribute to obesity. This is because smoking may be part of a cluster of unhealthy behaviours – namely low PA levels and unhealthy diets (Chiolero, Faeh, Paccaud, & Cornuz, 2008). Moreover, households with a smoker may indicate that the primary caregiver herself is a smoker, and numerous studies have linked maternal smoking during pregnancy as a risk factor behind childhood obesity (Gilman, Gardener, & Buka, 2008; Sharma, Cogswell, & Li, 2008; Gorog, et al., 2011).

4.7.2 Physical Activity Levels

Figure 4.2. PA Levels



PA levels (as seen in Fig.4.2) examined four sub-domains in children: **Moderate/ Vigorous Activity on Weekdays, Moderate/Vigorous Activity on Weekends, Sedentary Activity on Weekdays,** and **Sedentary Activity on Weekends.**

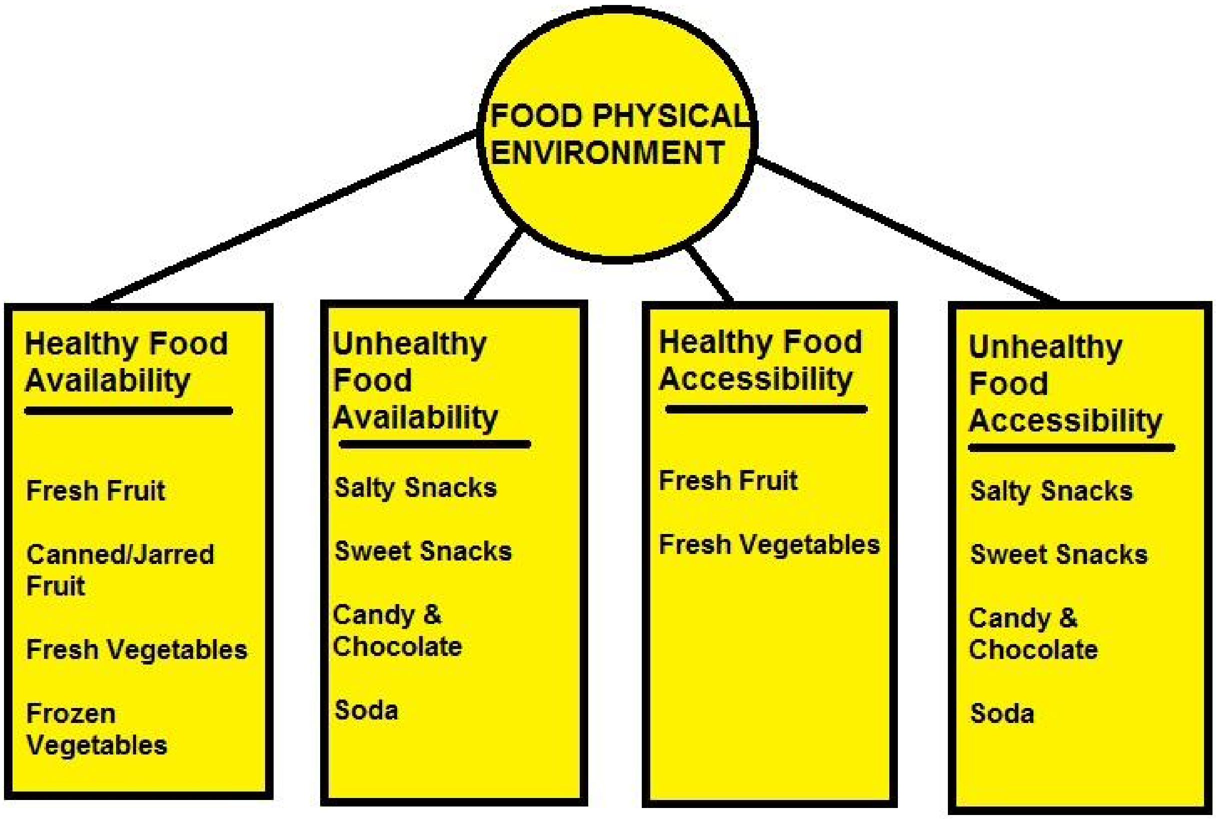
The **Moderate/Vigorous Activity on Weekdays** score was the addition of both average weekday moving or dancing to music (in minutes) and active play (in minutes). **Moderate/Vigorous Activity on Weekends** was the addition of the average weekend scores for moving/dancing to music and active play scores (both in minutes), which were first calculated by averaging both Friday and Saturday scores.

Since the NHS (2011) recommended at least 60 minutes of moderate/vigorous activity a day, 60 minutes was considered the threshold duration, by which both weekday and weekend durations were divided to get a ratio. Ratios of 0-0.99 were classed as unhealthy levels of moderate/vigorous activity, while ratios of 1 and above were considered healthier.

Both sedentary activity sub-domains (**Sedentary Activity on Weekdays** and **Sedentary activity on Weekends**) examined three behaviour items in the questionnaire: TV, computer/videogames, and light activity (which investigated whether children engaged in activities such as puzzles, arts and crafts)**. Sedentary Activity on Weekdays** was calculated by adding the average durations of TV, computer/videogames and light activity (all in minutes). **Sedentary Activity on Weekends** was calculated the same way, after averaging the durations of all activities on Friday and Saturday (in minutes).

4.7.3 Food Physical Environment

Figure 4.3. Food Physical Environment



The Food Physical Environment section (Fig.4.3) comprises four sub-domains: **Healthy Food Availability**, **Unhealthy Food Availability, Healthy Food Accessibility** and **Unhealthy Food Accessibility**.

In terms of food availability, **Healthy Food Availability** examined the availability of four food items at home: fresh fruit, fresh vegetables, frozen vegetables and canned/jarred fruit. **Unhealthy Food Availability** examined the availability of four food items: salty snacks, sweet snacks, candy/chocolate and soda. Scores for these two sub-domains were calculated by adding the number of kilograms of all foods within each sub-domain.

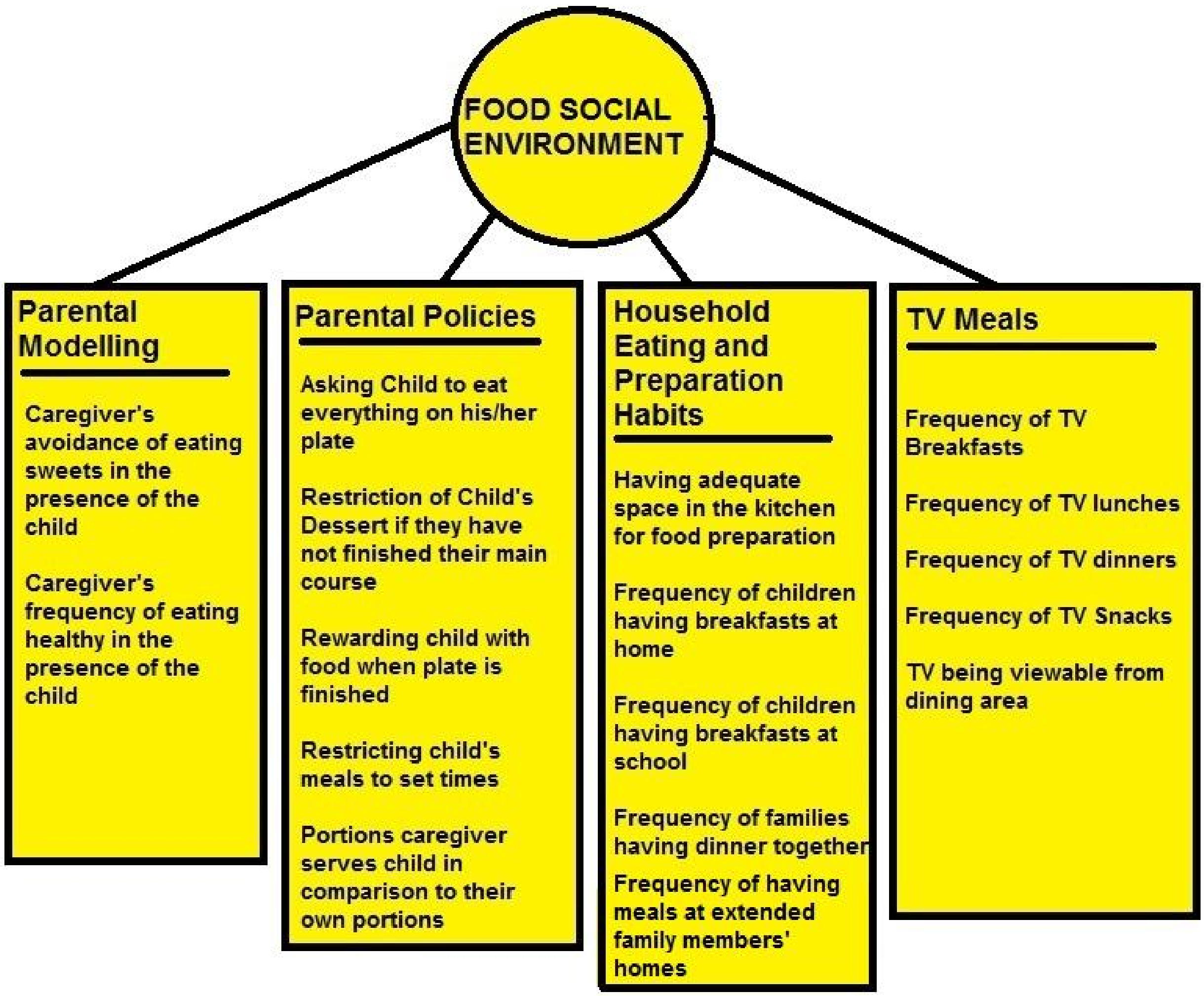
Simultaneously, a cut-off was generated for each household indicating the threshold/ideal amounts of **Healthy Food Availability** and **Unhealthy Food Availability** per day that houses should have, based on the number of people within each household. The HHS initially did not have any means to score availability, and the researcher had to create cut-offs to better analyse data. Studies suggest that from childhood onwards, one must eat at least 400g fruit and vegetables/day to prevent future chronic illnesses (Ashfield-Watt, Welch, Day, & Bingham, 2004; Lock, Pomerleau, Causer, Altmann, & McKee, 2005; Delgado-Noguera, Tort, Martinez-Zapata, & Bonfill, 2011). A score for the foods high in fat and sugar (which made up the unhealthy food category) was generated in comparison to the fruit and vegetable amounts by examining ratios within the NHS Eatwell Plate (2011). Fruit and vegetables (400g/day) made up a third of the Eatwell plate, and the number was used to calculate the relative number of foods high in fat and sugar on the plate. Foods high in fat and sugar make up 7% of the Eatwell plate (British Nutrition Foundation, 2013), which translates to 84 g/day. These threshold amounts were then multiplied by number of members within each household to generate a bespoke daily threshold of both food categories.

Current amounts of both healthy and unhealthy foods were divided by the threshold scores to generate a continuous ratio score. With respect to 'healthy food' availability, a ratio of 0-0.99 indicated an unhealthy availability, having below than recommended amounts; households with ratios of 1 or above had healthy amounts of availability. With respect to unhealthy food (foods high in fat and sugar), a ratio of 0-1 indicated healthy amounts at home, while ratios of 1.01 or more was considered unhealthy. Although the researcher acknowledges that scoring healthy thresholds would be more accurate according to guideline daily amounts and calories, this was not possible given the HHS questions (which were phone based and had used serving sizes and cups). Both calorific content and serving sizes/cups were difficult to measure in Egypt, because nutritional value is not necessarily placed on several food items, and also because food in Egypt is bought in bulk/weight (namely in kgs, which this study used to be culturally appropriate). Given these challenges, the ratio derivation was the most functional plan with respect to this study's context.

With respect to food accessibility, the two sub-domains investigating this were **Healthy Food Accessibility** and **Unhealthy Food Accessibility. Healthy Food Accessibility** assessed the reference child's access to fresh fruit and fresh vegetables, as well as visibility of fresh fruit in the living room (by the survey administrator). Children who had access to each healthy food item scored 1 while those who could not access them scored 0 (unhealthy), and having visible fresh fruit in the living space was scored 1. These three items were added to generate the **Healthy Food Accessibility** score. **Unhealthy Food Accessibility** examined the reference child's accessibility to salty snacks, sweet snacks, candy/chocolate and soda. Accessibility to each of the four unhealthy food items was scored 1, while no access was scored 0. The four scores were added to generate an **Unhealthy Food Accessibility** score.

4.7.4 Food Social Environment

Figure 4.4. Food social environment



The food social environment section (Fig.4.4) comprised four specific sub-domains: **Parental Modelling, Parental Policies, Household Eating and Preparation Habits**, and **TV Meals**. Scores for each sub-domain were generated (the higher the scores, the healthier the food social environment) and compared with both child BMI Z-scores and to socio-economic variables (both SES area and income) in accordance with the first two questions of the study.

In the **Parental Modelling** sub-domain, the frequencies of both the **Caregiver's avoidance of eating sweets in the presence of the child** and **Caregiver's frequency of eating healthily in the presence of the child** were scored. Both items had the 'Always'/'Mostly'/'Sometimes'/'Rarely'/'Never' answer categories in the HHS. Both items were scored on a scale of 0 to 4, 4 being the healthiest outcome ('Always') and 0 being the unhealthiest ('Never'). This scoring is based on studies that show that parental food preferences and habits influence children's consumption and eating habits (Patrick & Nicklas, 2005; Birch, 2006). Both behaviours were added to derive a parental modelling score, the highest attainable score being 8, the lowest being 0.

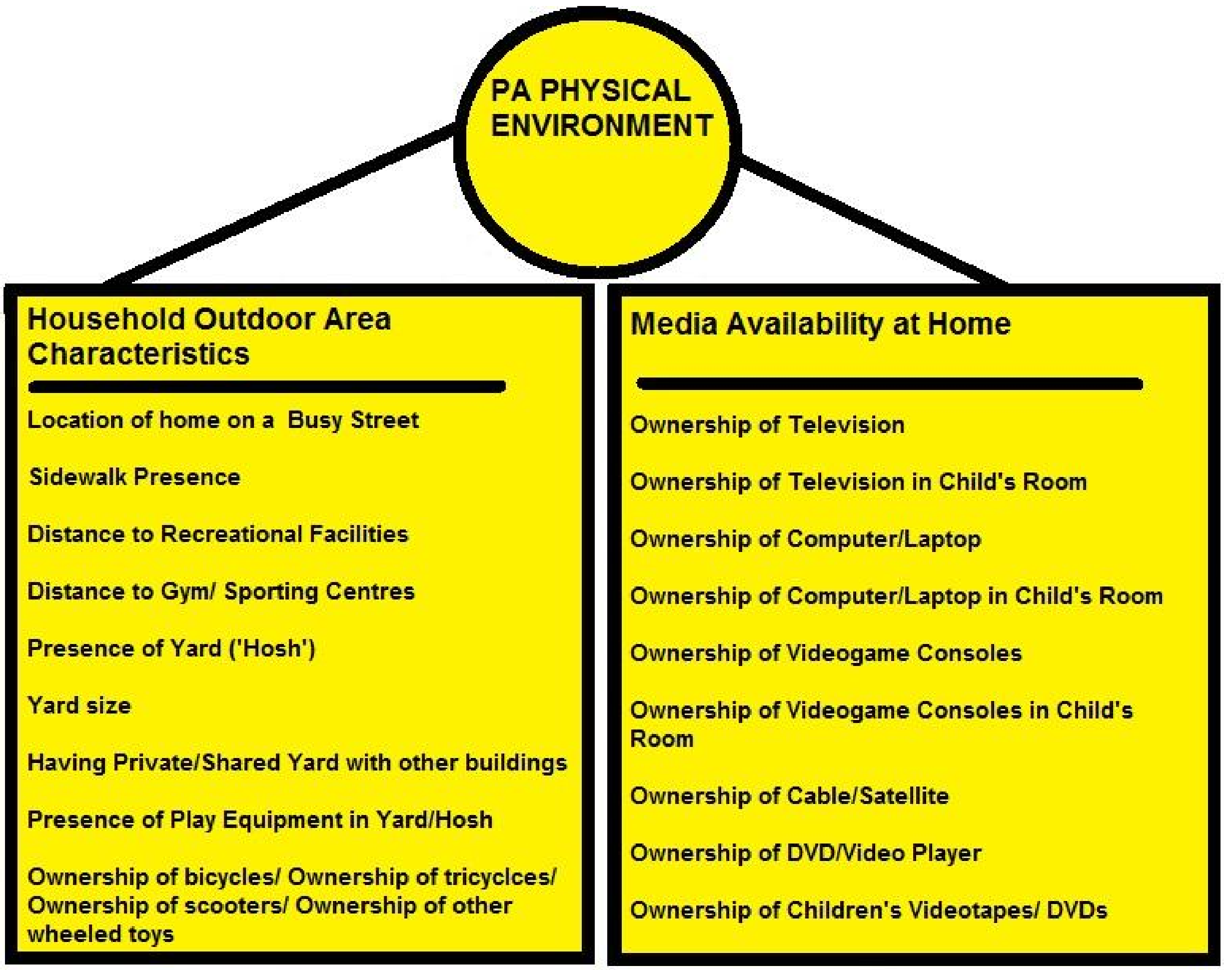
In the **Parental Policies** sub-domain, all actions that were characteristically restrictive, pressuring, or involved rewards were scored lower/unhealthier with increasing frequency, as they have been shown to be correlated to higher BMI in children (Faith, et al., 2004; Webber, Hill, Cooke, Carnell, & Wardle, 2010; Contento, 2011). This included the following three items: **'Asking the child to eat everything on his/her plate' , 'Restriction of child's dessert if they have not finished their main course'** and **'Rewarding the child with food when plate is finished'**. '**Restricting child's meals to set times'** was scored higher with increasing frequency, as establishing designated meal times are part of family-based childhood obesity prevention (Golan, Kaufman, & Shahar, 2006). All items were reported in 'Always'/'Mostly'/'Sometimes'/'Rarely'/'Never' frequencies and were thus scored on a scale of 0 to 4, 4 being the healthiest outcome and 0 being the unhealthiest. This section also included a fourth item, examining **'Portions caregiver serves child in comparison to their own portions'**, which were reported as 'Less than'/'Same Amounts'/' More than'. Since current UK guidelines report the recommended caloric intake of children (1800 calories) to be under that of adult women (2000 calories) or men (2500 calories) (NHS, 2009), serving large portions to children may indicate a dietary amount greater than the recommended daily amounts for children. This item was thus scored from 0 ('More than') to 2 ('Less than'). A cumulative parental policies score was calculated, wherein the highest/healthiest attainable score was 15, the lowest being 0.

The **Household Eating and Preparation Habits** sub-domain examined the nature of food preparation and eating at home. **'Having adequate space in the kitchen for food preparation'**, a Yes/No question, was scored a 1 for yes (healthy) while households without adequate space were scored a 0 (unhealthy). This is because food preparation (as opposed to reliance on readymade/outdoor meals) has been linked to less obesity and is usually recommended to reduce obesity (Cutler, Glaeser, & Shapiro, 2003; Fulkerson, et al., 2010; Barakat, Barakat, & Baaj, 2012). While readymade meals are not popular in Egypt, reliance on 24-hour service of easily delivered and cheap fast food/restaurant food is extremely popular. Higher **'Frequency of having meals at extended family members' homes'** was scored less than those did so less frequently because large family meals were shown to encourage overeating in an Arab context (Al-Isa, 1999). Breakfast frequency was also examined, including the **'Frequency of children having breakfasts at home'** and **'Frequency of children having breakfasts at school'.** Both items were reported in number of days per week in the HHS. Regular breakfasts have been correlated with decreased overweight and obesity in children (Huang, Hu, Fan, Liao, & Tsai, 2010; Patro & Szajewska, 2010; Antonogeorgos, et al., 2012). Therefore, **'Frequency of children having breakfasts at home'** was scored from 0-7, being scored higher with higher number of days per week. **'Frequency of children having breakfasts at school'** was also scored from 0-7, but was scored higher with lesser frequencies. This is because school diets in Egypt are inconsistent; even though the Egyptian government spends 60 million $ annually on the National School Feeding programme, it has been reported that distribution of food across schools remains inconsistent throughout the year (World Food Programme, 2013). Moreover, only 30% of Egypt's students benefit from this scheme, and the nutritional content of this scheme - milk, biscuits and sweet pies - is unknown (Global Child Nutrition Foundation , 2010). Therefore, there is an uncertainty that the child may eat (healthy) school meals at all. The **'Frequency of family having dinners together',** reported as number of days per week, was scored from 0-7, with higher scores given to higher frequencies. This is due to existing research on the benefits of family cohesion on childhood weight (Gillman, et al., 2000; Taveras, et al., 2005; Gable, Chang, & Krull, 2007; Hammons & Fiese, 2011). Questions dealing with dining table usage, which may have been useful in the Western setting in which the questionnaire was developed, were not scored due the variety of cultural meal surfaces in Egypt (including the low table, the *tabliyeh* and the large tray, *the seneya)*. Additionally, food shopping patterns were not included in the score, as the neighbourhood food environment was not investigated in the study, and neither were the items or quantities shopped during these trips. A cumulative **Household Eating and Preparation Habits** score was calculated, the highest/healthiest attainable score being 22, the lowest being 0.

The **TV Meals** section investigated 5 items: **'Frequency of TV breakfasts', 'Frequency of TV lunches', 'Frequency of TV dinners', 'Frequency of TV snacks'** and **'TV being viewable from the dining area'**. Each of the four TV meals was reported in number of days per week, thus scored between 0-7. However, since TV meals are considered unhealthy, the scoring was reversed, where 0 indicated seven days of a TV meal (the unhealthiest outcome) and 7 indicating 0 days of a TV meal (the healthiest outcome). Scoring was done in accordance to the reported increased risk of increased energy intake while eating and watching TV simultaneously (Bellissimo, Pencharz, Thomas, & Anderson, 2007; Temple, Giacomelli, Kent, Roemmich, & Epstein, 2007; Biddle, et al., 2010), especially energy dense snacks (Coon & Tucker, 2002; Francis, Lee, & Birch, 2003; Phillips, et al., 2004). **'TV being viewable from the dining area'** was a Yes/No question, and was scored 1 for (healthy) absence of TV ('No') and 0 for (unhealthy) presence ('Yes'). Scores for these five items were combined to generate a cumulative TV meal score. The highest score, 29, was considered the healthiest outcome, the lowest score was 0.

4.7.5 Physical Activity Physical Environment

Figure 4.5. PA Physical Environment



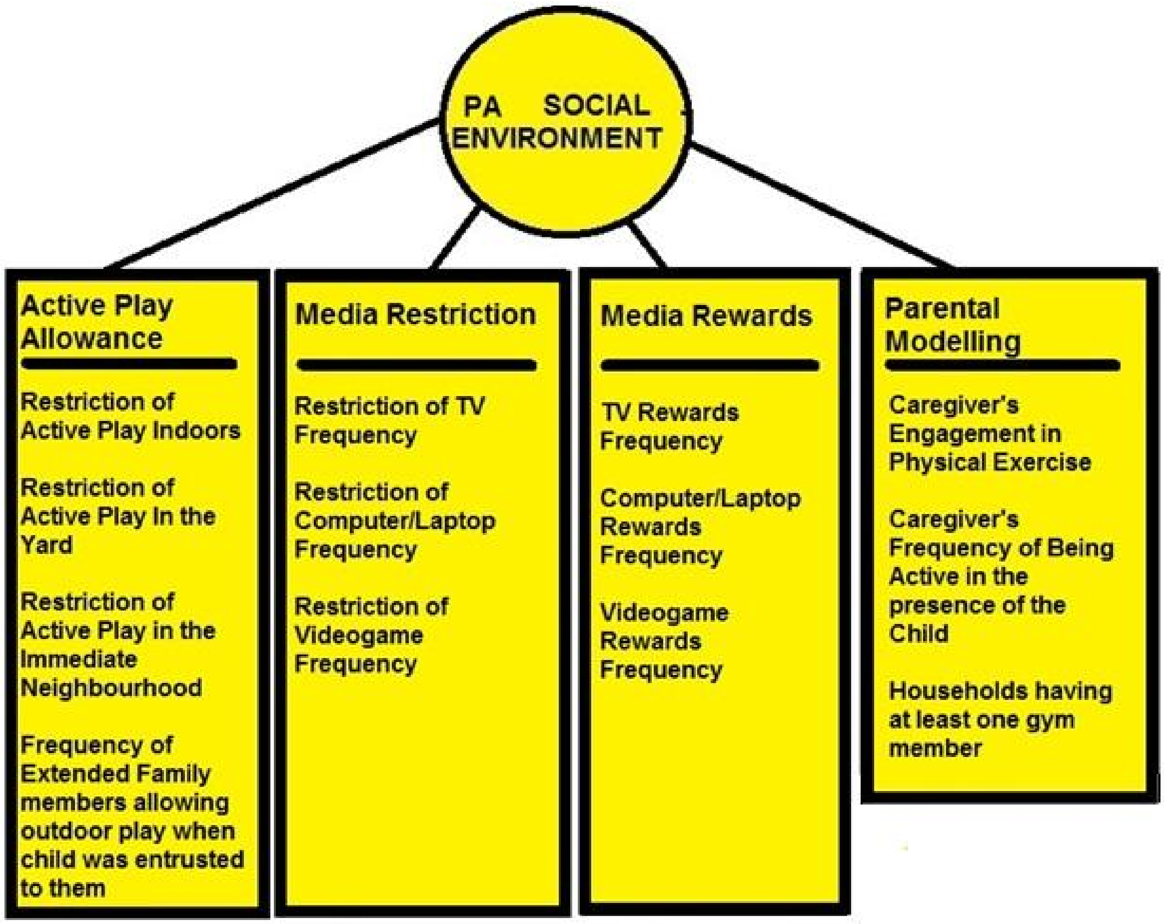
The **PA Physical Environment (Fig.4.5)** consisted of two main sub-domains. The first is **Household Outdoor Area Characteristics**, which investigated items which may facilitate/hinder childhood active play in close proximity to the home. The second sub-domain is **Media Availability at Home**, which investigated the presence of various media items in households and particularly in the reference children's bedrooms. Scores for both sub–domains were calculated.

Household Outdoor Area Characteristics combined 9 items investigated in the HHS. The first four items were to do with neighbourhood characteristics and included '**Location of home on a busy street'** (positively correlated with childhood obesity), '**Sidewalk presence**' (negatively correlated with childhood obesity in previous studies), **'Distance to recreational facilities'** and '**Distance to gym/sporting centres'** (both negatively correlated with childhood obesity in the literature). Since these four items were all Yes/No responses, they were scored 0 (unhealthy) or 1 (healthy) according to whether they are positively or negatively correlated with childhood obesity. The next five items investigated play characteristics, and were scored according to accessibility to the included PA equipment and perceived safety, both negatively correlated to childhood obesity (Pena & Baccalao, 2000; Gordon-Larsen, Nelson, Page, & Popkin, 2006; Griffith, et al., 2007; Dunton, Kaplan, Wolch, Jerret, & Reynolds, 2009). The following five items, **'Presence of a yard (hosh)'** – hosh is a yard in Arabic, **'Yard size', 'Having a private/shared yard with another building', 'Presence of play equipment in the yard/hosh'** and **'Ownership of bicycles/ownership of tricycles/ownership of scooters/ownership of other wheeled toys'** investigated play characteristics. Most of these questions were scored 0 or 1 as they were Yes/No responses, with 1 being healthier and 0 being unhealthier. The only exception was the question relating to yard size (reported as 'Small'/'Medium'/'Large' in the HHS), which was scored 0-2 according to larger/healthier spaces to play. All these items were combined to generate a cumulative **Household Outdoor Area Characteristics** score, the highest score being 13 and the lowest score being 0.

The **Media Availability at Home** sub-domain examined (through 'Yes'/'No' responses) nine items, which included '**Ownership of television', 'Ownership of television in child's room', 'Ownership of computer/laptop', 'Ownership of computer/laptop in child's room', 'Ownership of videogame consoles', 'Ownership of videogame consoles in child's room', 'Ownership of cable/satellite', 'Ownership of DVD/Video player'** and **'Ownership of Children's videotapes/DVDs'**. Since findings on media availability's impact on obesity and PA have often been mixed and contradictory, a cumulative media availability score was calculated out of 9 (9 indicating the highest media availability at home, and 0 indicating the lowest).

4.7.6 Physical Activity Social Environment

Figure 4.6. PA Social Environment



The PA Social Environment section (Fig 4.6) involved four sub-domains: **Active Play Allowance, Media Restriction, Media Rewards,** and **Parental Modelling. Active play allowance** included four items: '**Restriction of active play indoors', 'Restriction of active play in the yard', 'Restriction of active play in the immediate neighbourhood'** and **'Frequency of extended family members allowing outdoor play when child was entrusted to them'**. These items were scored according to how they promote PA, therefore the first three items were scored lower with higher frequency and the fourth was scored higher with higher frequency. Since all the items were frequency scores ('Always'/'Mostly'/'Sometimes'/'Rarely'/'Never'), they were scored from 0-4, with 4 being the healthiest option and 0 being the unhealthiest option. The scores from the mentioned four items comprising **'Active Play Allowance'** were then added to derive a cumulative play allowance score, the highest/healthiest attainable score being 16, the lowest/unhealthiest score being 0.

Studies on **Media Restriction** and obesity have found that restriction of TV watching to have a negative correlation with TV time among both children and adolescents (Cillero & Jago, 2010; te Velde, et al., 2011). Interventions to reduce children's TV hours have been shown to have a positive effect on childhood obesity (Robinson, 2001; Leung, Agaronov, Grytsenko, & Yeh, 2012). However, restriction was observed as parenting style behaviour, and literature suggests that authoritative (democratic, moderate, child-centric) parenting styles have beneficial impacts on childhood BMI as opposed to authoritarian (strict) or indulgent (permissive) styles (Berge, Wall, Loth, & Neumark-Sztainer, 2010; Franklin, 2012). This rationale was applied to both media restriction and rewards scores. Moderate restriction of media items was thus scored higher/healthier, and the most/least restrictive households were considered least healthy. The media restriction section involved three items **'Restriction of TV frequency', 'Restriction of videogames frequency'** and **'Restriction of computer/laptop frequency'**; each item was reported as always/mostly/sometimes/rarely/never. 'Sometimes' scored 2, 'mostly'/'rarely' scored 1, and 'always/never' scored 0. A cumulative media restriction score was calculated, 6 being the highest/healthiest and 0 being the lowest/unhealthiest. Households which did not own any of the three media items did not respond to the questions about that specific media item. In accordance with the rest of the coding process the author generated a cumulative media restriction score as with most of the other sub-domains in the HHS, as there was no coding scheme offered by the initial HHS. The author acknowledges that using the cumulative scoring procedure may give households with a greater number of media items a higher cumulative score as opposed to those who did not (as opposed to a mean), but this was done to remain consistent with the rest of cumulative scores. Even though households may have had more than one item, yet the author was focusing on the use of media items as restrictions/rewards rather than the variety of media at home, which was investigated in the previous media availability sections.

The same parenting style rationale and scoring were used in the **Media Rewards** section, which describes how often caregivers rewarded children's good behaviour with media usage. The three items investigated were **'TV rewards frequency', 'videogame rewards frequency' and 'computer/laptop rewards frequency'.** Moderate ('sometimes') were scored 2 (healthiest), 'mostly' and 'rarely' were scored 1, and the most/least restrictive households ('always'/'never') were scored 0 (least healthy). The scores for the three media items were used to generate a cumulative media rewards score; 6 being the healthiest and 0 being the unhealthiest.

Parental PA Modelling was scored according to studies which indicate that children whose parents are both usually physically active are more likely to engage in PA than those with inactive parents (Moore, et al., 1991; Kohl III & Hobbs, 1998; Welk, Wood, & Morss, 2003; Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008; Crawford, et al., 2010), even though some studies have found mixed results with respect to this relationship (Gustafson & Rhodes, 2006; Lim & Biddle, 2012). Parental PA modelling comprised 3 items**: caregiver's engagement in physical exercise, caregiver's frequency of being active in the presence of the child,** and **households having at least one gym member**. All four items in the household PA health section were scored according to PA levels – the higher, the healthier. 'Caregivers' engagement in physical exercise' and 'frequency of being active in the presence of the child' (both always/mostly/sometimes/rarely/never items) were scored between 0-4, 4 being always (healthiest) and 0 being never (unhealthiest). 'Households having at least one gym member' (a Yes/No question) scored 1 for Yes (healthy) and 0 for No (unhealthy). Households with members that had an illness affecting their PA levels (a Yes/No question) was scored 0 for Yes (unhealthy) and 1 for No (healthy). A cumulative **parental modelling** score consisting of the previous items was generated, the highest/healthiest score being a 10, the lowest being 0.

4.7.7 Data Protection

Data containing personal details was collected with informed consent of the respondent, and all data was collected and kept in a safe environment (electronic or otherwise).

4.8 Quantitative Study Results

This section presents the results of the study's quantitative phase. Childhood anthropometric measures (BMI Z-scores and WtHR, initially recorded as continuous variables during data collection) are described as both binary categorical variables (dichotomisation) and continuous variables, and are analysed as continuous variables. BMI Z-score binary categories were 'healthy/underweight' (Z-score < 1) and 'overweight/obese' (Z-score ≥ 1), WtHR categories were 'healthy' (WtHR < 0.5) and 'at risk' (WtHR ≥ 0.5). The binary scores for BMI and WtHR were informed by international cut-offs for both measures (WHO, 2008; Browning, Hsieh, & Ashwell, 2010; Wang & Chen, 2012; Graves, et al., 2013) and also by the BMI Z-scores and WtHRs within the sample. The rationale behind subjecting anthropometric data to dichotomisation for the descriptive section is that it allows for a clearer interpretation of data according to international standards, and also allows for generation of recommendations/treatment (Mazumdar & Glassman, 2000; Williams, Mandrekar, Mandrekar, Cha, & Furth, 2006; Baneshi & Talei, 2011). Analysis of relationships between childhood weight and home environment variables were carried out using continuous BMI Z-scores and WtHRs; dichotomising them would cause loss of information, potency, and the ability to accurately detect relationships between variables (MacCallum, Zhang, Preacher, & Rucker, 2000; Altman & Royston, 2006; Baneshi & Talei, 2011). In this study's case, the results aimed to assess the significance of relationships between BMI Z-scores/WtHR and the various scores generated in the HHS.

Section 4.8.1 is a description of the sample, including age and gender of the children as well as a presentation of the SES variables (SES area and income categories) and an investigation (through Kappa agreement) of how well the SES variables agree with one another. Section 4.8.2 describes the anthropometric outcomes in children. This section firstly presents anthropometric measures as categorical variables in descriptive tables. The section then deals with anthropometric measures as continuous variables, presenting them as histograms. Section 4.8.2 then analyses continuous BMI Z-scores and WtHRs by linear regression, examining the impact of age, gender (Model 1) and SES factors (Model 2).

4.8.1 Sample Description

In total, 210 households participated in the survey, 70 from each SES area. One child respondent was not available to be measured on both occasions the household was visited, thus all statistical tests with childhood weight as a variable involved a sample of 209 households. In all households, the primary caregiver was the child's mother. The majority of caregivers (47.1%, n = 99) were aged 30-39 years, 28.1% (n = 59) were aged 20-29 years, 21% (n = 44) were aged 40-49 years and 3.8% (n = 8) were aged 50-59 years. Of the 210 caregivers, only 22 (10.5%) worked full time; the rest were housewives.

Most of the reference children (45.7%, n = 96) were 2–5 years old, while 20% (n = 42) were 6–8 years old and 34.3% (n = 72) were 9–12 years old. Among the reference children, 52.9% (n = 111) were girls and 47.1% (n = 99) were boys.

Figure 4.7. Age and gender of reference children

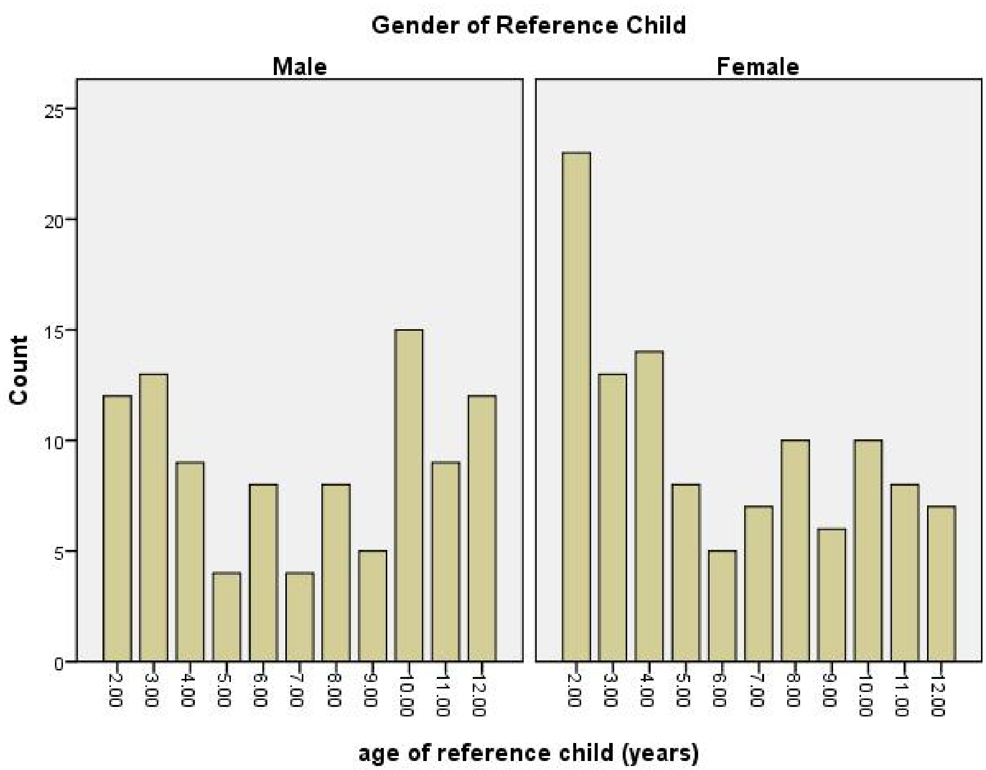


Figure 4.7 shows that among the sample, younger children were more likely to be girls, while older children were more likely to be boys. Mann-Whitney U test revealed a significant difference between boys' age (Md = 7.6, SD = 3.44) and girls' age (M = 6.36, SD = 3.42), U = 4431.5, z = -2.148, and p = 0.017.

Table 4.2. Socio-economic variables within the sample

SES area	Income (per month)		
	Low (1500 LE and under)	Middle (1501-2500 LE)	High (2501 LE and above)
Low SES	50 (71.4%)	20 (28.6%)	0 (0%)
Lower Middle SES	27 (38.6%)	34 (48.6%)	9 (12.9%)
Higher Middle SES	9 (12.9%)	35 (50%)	26 (37.1%)

Table 4.2 shows income groups compared to SES areas of households within the sample. Reliance on the given poverty lines of Egypt in 2011 ($1.65 a day) (UNICEF, 2011) is inaccurate, as poverty rates are underestimated in Egypt, failing to take into account settlers in informal shantytowns which are undercounted as well as the cost being too low relative to costs of daily needs and everyday life (Sabry, 2010). The income group scale used in the modified HHS began at 'Under 500 LE' and ended with '4000 LE and above' in increments of 500 LE. Very few households were found in the high end of the income scale (3001+ LE), which was expected given people earning high incomes lived in gated communities outside the city that were excluded from the study. For pragmatic reasons involving reported household incomes, household income was divided into three categories according to the reports. These three categories were 1500 LE and under, 1501 LE - 2500 LE, and 2501 LE and above, as seen in table 4.2. As expected, the lowest income bracket was mostly found in low SES area households (n = 50, 71.4%). The number of people in the highest income bracket increased with increasing SES area. Some households had higher income brackets than the area that they lived in, which was why both an area based and a personal based SES variable were measured. Kappa measure of agreement was run between both variables, and while agreement was significant (p <0.001), it was less than moderate (Kappa = 0.286). Later

multiple linear regressions used SES area for the socio–economic model given the results of the Kappa agreement and more even numbers (70 from each category as opposed to income groups which varied in numbers). Moreover, later analyses show greater significant differences between SES areas in home environment scores compared to income groups, suggesting that SES showed greater discrimination in analyses.

4.8.2 Childhood Weight

Anthropometric data revealed that 37.8% of reference children (n = 79) had healthy/thin BMI Z-scores (under 1 SD), while 9.6% were classified as underweight (n = 18). Moreover, 32.1% (n = 67) were overweight, and 21.5% (n = 45) were obese. With respect to WtHR, 50.7% (n = 106) had healthy WtHRs and 49.3% (n = 103) had at risk WtHRs. BMI Z-score categories were grouped into two categories based on the above numbers of overweight/obese and underweight/healthy children. Moreover, as WtHR only distinguishes between healthy (below 0.5) and at-risk (0.5 and above) categories, it was decided to present both as dichotomous variables for consistency even though the author acknowledges that grouping BMI Z-score into dichotomous variables may affect the data's potency. However, categorised anthropometric measures were used only in Chi-square analyses against individual question items; all other analyses used continuous anthropometric measures to retain the anthropometric data's potency. Table 4.3 shows the descriptive data of childhood BMI Z-scores and WtHR vs SES area, income, age and gender.

Table 4.3. Childhood BMI & WtHR categories Vs SES area, income, age and gender

		SES Area (N = 209)			Income (N = 209)			Age			Gender	
		Low SES (n = 69, 33%)	Lower Middle SES (n = 70, 33.5%)	Higher Middle SES (n = 70, 33.5%)	Under 1500 LE (n = 85, 40.6%)	1501-2500 LE (n = 89, 42.6%)	2501 LE and above (n =35, 16.8%)	2-5 years old (n = 96, 45.9%)	6-8 years old (n = 41, 19.6%)	9-12 years old (n = 72, 34.5%)	Male (n = 99, 47.4%)	Female (n = 110, 52.6%)
Childhood BMI Z-score categories	**Healthy/ Underweight (n = 99, 47.4%)**	36 (36.4%)	37 (37.4%)	26 (26.3%)	43 (43.4%)	43 (43.4%)	13 (13.1%)	41 (41.4%)	19 (19.2%)	39 (39.4%)	45 (45.5%)	54 (54.5%)
	Overweight/ Obese (n = 110, 52.6%)	33 (30%)	33 (30%)	44 (40%)	42 (38.2%)	46 (41.8%)	22 (20%)	55 (50%)	22 (20%)	33 (30%)	54 (54.5%)	56 (50.9%)
Chi- Square and p value		4.421 (p = 0.110)			1.853 (p = 0.396)			2.188 (p = 0.335)			0.276 (p = 0.599)	
Childhood WtHR categories	**Healthy (n = 106, 50.7%)**	36 (34%)	34 (32.1%)	36 (34%)	41 (38.7%)	46 (43.4%)	19 (17.9%)	27 (25.5%)	24 (22.6%)	55 (51.9%)	61 (57.5%)	38 (36.9%)
	At risk (n = 103, 49.3%)	33 (32%)	36 (35%)	34 (33%)	44 (42.7%)	43 (41.7%)	16 (15.5%)	69 (67%)	17 (16.5%)	17 (16.5%)	45 (42.5%)	65 (63.1%)
Chi- Square and p value		0.202 (p = 0.904)			0.421 (p = 0.810)			39.951** (p <0.001)			8.939** (p = 0.003)	

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.3 shows that 52.6% (n = 110) of reference children were overweight/obese. With respect to WtHR scores, 106 children (50.7%) were healthy while 103 (49.3%) had at risk WtHRs. Chi-square test of association was carried out to compare binary BMI and WtHR categories among SES area, income groups, age and gender. There were no significant associations between weight categories and SES variables, although the relationship between SES and BMI Z-score approached significance, whereby 40% (n = 44) of overweight/obese children were from the higher middle SES area. There was a significant association with age in WtHR categories. With respect to WtHR categories ($\chi^2 = 39.951$, $p < 0.001$), the percentage of at risk children significantly decreased with increasing age group. Gender was also only significant with respect to WtHR scores ($\chi^2 = 8.939$, $p = 0.003$), wherein a higher percentage of at risk WtHRs was found among girls (63.1%, n = 65) compared to boys (38.4%, n = 38). Because of the statistically significant age and gender associations (at least with WtHR), it was necessary to control for these two factors in all subsequent analyses.

Figure 4.8. Childhood BMI Z-score histogram

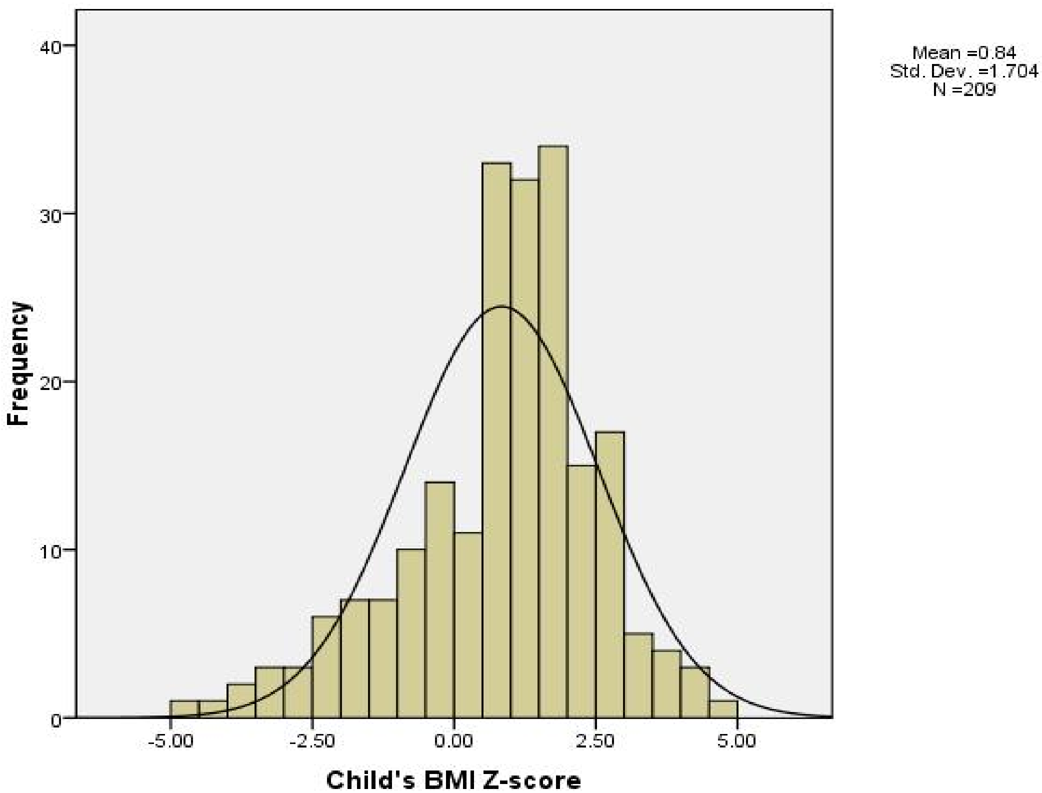


Figure 4.8 shows the distribution of continuous BMI Z-scores among the sample (N = 209). The histogram reveals a very slightly skewed curve, whereby the mean BMI Z-score is 0.84 (SD = 1.704), which places the majority of the children within a healthy BMI Z-score range (between 1 and -1). Although slightly skewed (Kurtosis of -1< x <1), linear regression was employed as linear regression is robust in slightly skewed data (Osborne & Waters, 2002).

Figure 4.9. Childhood WtHR histogram

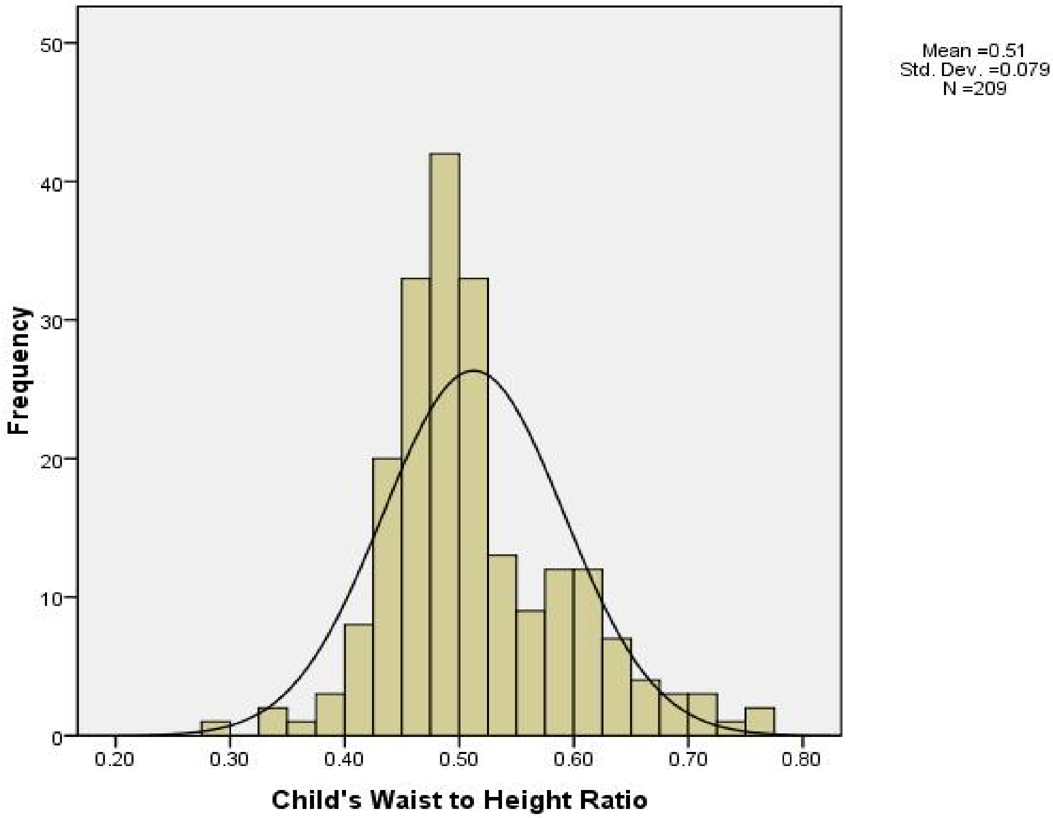


Figure 4.9 shows the frequencies of continuous childhood WtHRs in the sample. The frequencies also follow a slightly skewed distribution, to which linear regression can also be applied. The histogram reveals that the mean WtHR among the sample is 0.51 (SD = 0.079), which means that the mean WtHR is slightly above the international WtHR at risk cut-off point (WtHR cut-off = 0.50).

Table 4.4. Summary of linear regression analysis for age, gender and SES predicting child BMI Z-score and WtHR

	BMI Z-Score						WtHR					
	Model 1			Model 2			Model 1			Model 2		
	B	SE B	Β	B	SE B	β	B	SE B	Β	B	SE B	β
Age 2-5	Reference group			Reference group			Reference group			Reference group		
Age 6-8	0.396	0.319	0.093	0.482	0.321	0.113	-0.053	0.013	-0.267**	-0.057	0.013	-0.286**
Age 9-12	-0.143	0.269	-0.040	-0.060	0.272	-0.117	-0.070	0.011	-0.421**	-0.073	0.011	-0.441**
Female	Reference group			Reference group			Reference group			Reference group		
Male	0.188	0.239	0.055	0.164	0.239	0.048	-0.021	0.010	-0.133*	-0.020	0.010	-0.128*
Low SES area	.			Reference group			.			Reference group		
Low Middle SES area	.	.	.	-0.169	0.289	-0.047	.	.	.	-0.001	0.012	-0.007
High Middle SES area	.	.	.	0.334	0.291	0.093	.	.	.	-0.021	0.012	-0.124
R^2	0.015			0.030			0.202			0.216		
F for R^2	1.069			1.257			17.321**			11.205**		

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.4 presents the results of linear regression analyses for factors of childhood weight. Neither model was significant with respect to BMI Z-score but both were highly significant with respect to WtHR. The first model which examined age and gender ($F = 17.321$, $p < 0.01$) revealed that being 6-8 years old ($B = -0.267$, $p < 0.01$) and being 9-12 years old ($B = -0.421$, $p < 0.01$) significantly decreased WtHR compared with being in the youngest category (2-5 years). Gender was also a significant factor, where males had a significantly lower WtHR ($B = -0.021$, $p < 0.05$). The second model, incorporating SES factors ($F = 11.205$, $p < 0.01$) revealed that while age and gender remained significant factors, SES factors were not significant. This multivariate analysis on child weight, controlling for age and gender (model 1) and age, gender and SES (model 2) was subsequently used to determine how to test the effects of all the PA and food variables in turn. Later multiple regression analyses of home environment scores only included age and gender (model1), since SES factors were not significant factors with respect to childhood weight.

Sections 4.8.3 to 4.8.8 describe the sub-domains within the HHS. Each of these sections starts by addressing the research question 1, investigating significant relationships between various home environment aspects and childhood weight. This is done by initially presenting the descriptive data within the sub-domain, displaying tables of the categorised results of each questionnaire item in this sub-domain. These descriptive tables also present results of Chi-square analysis between categorised responses and the binary weight categories. Each section then presents correlation analyses between sub-domain scores (continuous) and anthropometric measures (BMI and WtHR) as continuous variables. Pearson's correlation was used for normally distributed histograms, while Spearman's was used for histograms that were not normally distributed. Following this, research question 2 is addressed, examining differences between SES areas/income groups with respect to the calculated sub-domain scores (continuous variables). Prior to analysis of sub-domain scores, histograms for all sub-domain scores were generated to investigate normality. Normally distributed sub-domain scores were subjected to parametric tests (ANOVA), while skewed distributions were subjected to non-parametric tests (Kruksall-Wallis). Section 4.8.9 re-examines question 1 in greater depth, presenting two multiple linear regression analyses to investigate the strength of factors found to be significantly correlated with anthropometric measures after adjusting for age and gender. Normally distributed scores were added to the regression model as continuous variables, while scores that were not normally distributed were analysed as categorical variables.

4.8.3 Food Physical Environment

Table 4.5. Descriptive table of the relationship between food physical environment, child BMI Z-score and WtHR

Food Availability Item (g/day/number of people per household)			Childhood BMI Z-score categories: Underweight /Healthy (n = 99, 47.4%)	Childhood BMI Z-score categories: Overweight/ Obese (n = 110, 52.6%)	Chi-Square and p value	Childhood WtHR categories: Healthy (n = 106, 50.7%)	Childhood WtHR categories: At risk (n =103, 49.3%)	Chi Square and p value
Healthy Food Availability (N = 209)	**Healthy Amounts (n = 203, 97.1%)**		94 (94.9%)	109 (99.1%)	3.205 (p = 0.073)	103 (97.2%)	100 (97.1%)	0.001 (p = 0.972)
	Unhealthy Amounts (n = 6, 2.9%)		5 (5.1%)	1 (0.9%)		3 (2.8%)	3 (2.9%)	
Unhealthy Food Availability (N = 209)	**Unhealthy Amounts (n = 193, 92.3%)**		89 (90.8%)	104 (94,5%)	1.077 (p = 0.299)	96 (91.4%)	97 (94.2%)	0.586 (p = 0.444)
	Healthy Amounts (n = 15, 7.7%)		9 (9.2%)	6 (5.5%)		9 (8.6%)	6 (5.8%)	
Food Accessibility Item			**Underweight /Healthy (n = 98, 46.4%)**	**Overweight/ Obese (n = 110, 53.6%)**		**Healthy (n = 105, 50.5%)**	**At risk (n =103, 49.5%)**	
Healthy Food Accessibility	**Fresh Fruit (N = 208)**	**Yes (n = 151, 72.6%)**	67 (68.4%)	84 (76.4%)	1.666 (p = 0.197)	89 (84.8%)	62 (60.2%)	15.755** (p < 0.001)
		No (n = 57, 27.4%)	31 (31.6%)	26 (23.6%)		16 (15.2%)	41 (39.8%)	
	Fresh Vegetables (N = 208)	**Yes (n = 140, 67.3%)**	68 (69.4%)	72 (65.5%)	0.364 (p = 0.536)	88 (83.8%)	52 (50.5%)	26.240** (p < 0.001)
		No (n = 68, 32.7%)	30 (30.6%)	38 (34.5%)		17 (16.2%)	51 (49.5%)	
	Fresh Fruit Visible (N = 208)	**Yes (n = 104, 50%)**	44 (44.9%)	60 (54.5%)	1.929 (p = 0.165)	54 (51.4%)	50 (48.5%)	0.173 (p = 0.677)
		No (n = 104, 50%)	54 (55.1%)	50 (45.5%)		51 (48.6%)	53 (51.5%)	

Food Accessibility Item			Underweight /Healthy (n = 98, 46.4%)	Overweight/ Obese (n = 110, 53.6%)		Healthy (n = 105, 50.5%)	At risk (n =103, 49.5%)	
Unhealthy Food Accessibility	Salty Snacks (N = 208)	Yes (n =161, 77.4%)	77 (78.6%)	85 (77.3%)	0.051 (p = 0.822)	91 (86.7%)	71 (68.9%)	9.494** (p = 0.002)
		No (n = 46, 22.6%)	21 (21.4%)	25 (22.7%)		14 (13.3%)	32 (31.1%)	
	Sweet Snacks (N = 208)	Yes (n = 125, 60.1%)	65 (66.3%)	60 (54.3%)	3.000 (p = 0.083)	84 (80%)	41 (39.8%)	35.029** (p < 0.001)
		No (n = 83, 39.9%)	33 (33.7%)	50 (45.5%)		21 (20%)	62 (60.2%)	
	Candy/ Chocolate (N = 208)	Yes (n = 133, 63.9%)	67 (68.4%)	66 (60%)	1.574 (p = 0.210)	87 (82.9%)	46 (44.7%)	32.903** (p < 0.001)
		No (n = 75, 36.1%)	31 (31.6%)	44 (40%)		18 (17.1%)	57 (55.3%)	
	Soda (N = 208)	Yes (n = 125, 60.1%)	33 (33.7%)	50 (45.5%)	3.000 (p = 0.083)	83 (79%)	42 (40.8%)	31.757** (p < 0.001)
		No (n = 83, 39.9%)	65 (66.3%)	60 (54.5%)		22 (21%)	61 (59.2%)	

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.5 shows the descriptive data from the food physical environment. In this table, food availability was divided into healthy and unhealthy levels (calculated by g/day/number of people per household threshold amounts). Healthy food (fresh fruit, canned/jarred fruit, fresh vegetables, frozen vegetables) was abundant in households; 97.1% of households (n = 203) had healthy amounts in g/day/number of people per household. Unhealthy food items (salty snacks, sweet snacks, candy/chocolate, soda) were also abundant (higher than the desired amounts) in g/day/number of people per household at home (92.3% of the sample, n = 193). Healthy food accessibility measured whether the reference child could help themselves to fresh fruit and fresh vegetables, as well as the visibility of fresh fruit in the living room. The majority of households reported that both fresh fruit and fresh vegetables were accessible to the reference child (n = 151 and n = 140, respectively). Fresh fruit was visible in a half of the households interviewed (50%, n = 104). Unhealthy food accessibility measured whether reference children could access salty snacks, sweet snacks, candy/chocolate and soda. All four items were accessible to the majority of reference children, and all Chi-square tests in each unhealthy food item accessibility showed a significant association between children's WtHR categories, where healthy WtHR children were significantly more likely to have access unhealthy food items on their own than children with at risk WtHRs.

Table 4.6. Correlations between food physical environment and child BMI Z-score/WthR

Childhood weight		Correlation score	p value
BMI Z-score	**Vs Healthy Food Availability (Pearson's r)**	0.135	0.052
	Vs Unhealthy Food Availability (Pearson's r)	0.055	0.429
	Vs Healthy Food Accessibility (Spearman's ρ)	0.055	0.433
	Vs Unhealthy Food Accessibility (Spearman's ρ)	0.074	0.288
WtHR	**Vs Healthy Food Availability (Pearson's r)**	-0.075	0.283
	Vs Unhealthy Food Availability (Pearson's r)	-0.056	0.425
	Vs Healthy Food Accessibility (Spearman's ρ)	-0.380**	< 0.001
	Vs Unhealthy Food Accessibility (Spearman's ρ)	-0.448**	< 0.001

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.6 displays the results of correlation analyses between food availability and accessibility scores against childhood BMI Z-scores and WtHR as continuous variables. Pearson's correlation analyses were employed for availability scores (normally distributed) while Spearman's were used for accessibility scores (skewed). The only significant correlations were found between food accessibility scores and WtHR. Healthy food accessibility scores showed a strong negative correlation with WtHR (Spearman's rho = -0.380, $p < 0.001$), meaning the greater accessibility to healthy food, the lower the child's WtHR. Unhealthy food accessibility scores also revealed a significant negative correlation with WtHR (Spearman's rho = -0.448, $p < 0.001$), where higher accessibility to unhealthy food was correlated with lower WtHR.

Table 4.7. Differences in food physical environment between SES categories

Food Availability			Mean (SD)	Test Score	p value
Healthy Food Availability (g) (N = 209)	Vs SES area (ANOVA)	Low SES (n = 70, 33.3%)	6057.1 (2429.14)	6.470**	0.002
		Lower Middle SES (n = 70, 33.3%)	7514.5 (3006.09)		
		Higher Middle SES (n = 70, 33.3%)	8001.4 (4269.69)		
	Vs Income (ANOVA)	Low Income (n = 86, 41.1%)	5731.8 (2467.42)	22.123**	< 0.001
		Middle Income (n = 89, 42.5%)	7561.8 (3029.12)		
		High Income (n = 35, 16.7%)	9782.9 (4457.35)		
Unhealthy Food Availability (g) (N = 209)	Vs SES area (ANOVA)	Low SES (n = 70, 33.3%)	2007.1 (1662.75)	22.487**	< 0.001
		Lower Middle SES (n = 70, 33.3%)	3284.1 (2227.81)		
		Higher Middle SES (n = 70, 33.3%)	8001.4 (4269.69)		
	Vs Income (ANOVA)	Low Income (n = 86, 41.1%)	2381.2 (2277.66)	21.128**	< 0.001
		Middle Income (n = 89, 42.5%)	3388.8 (2205.44)		
		High Income (n = 35, 16.7%)	5511.4 (3080.56)		
			Median		
Healthy Food Accessibility Score (N = 208)	Vs SES area (Kruksall–Wallis)	Low SES (n = 70, 33.3%)	2	2.370	0.306
		Lower Middle SES (n = 70, 33.3%)	2		
		Higher Middle SES (n = 70, 33.3%)	2		
	Vs Income (Kruksall–Wallis)	Low Income (n = 86, 41.1%)	2	1.970	0.374
		Middle Income (n = 89, 42.5%)	2		
		High Income (n = 35, 16.7%)	2		
Unhealthy Food Accessibility Score (N = 208)	Vs SES area (Kruksall–Wallis)	Low SES (n = 70, 33.3%)	0	7.516*	0.023
		Lower Middle SES (n = 70, 33.3%)	0		
		Higher Middle SES (n = 70, 33.3%)	2		
	Vs Income (Kruksall–Wallis)	Low Income (n = 86, 41.1%)	0	0.921	0.631
		Middle Income (n = 89, 42.5%)	0		
		High Income (n = 35, 16.7%)	0		

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.7 presents analyses run between food availability and accessibility scores (as continuous variables in grams) and socio-economic variables (SES area and income groups). Food amounts here were kept as continuous variables to retain statistical power, whereas in table 4.4 they were categorised to show how far above/below healthy threshold levels of food items each household owned for descriptive purposes only. Histograms of amounts (g) of healthy and unhealthy food available followed assumptions of normality, therefore one way ANOVA analyses were employed. Food accessibility scores, which did not follow assumptions of normality, were subjected to Kruksall-Wallis tests. One way ANOVA revealed significant differences in healthy food availability between SES areas (F = 6.470, p = 0.002) and between income groups ($F = 22.123$, $p < 0.001$), where increasing SES area level and income group translated to higher mean healthy food amounts, from 6.1 kg per household in low SES area households to 8 kg in high middle SES area households. Post-hoc tests (Tukey HSD) revealed that the low SES area food availability mean ($M = 6057.1$, $SD = 2429.14$) differed significantly from the lower middle SES mean ($M = 7514.5$, $SD = 3006.09$) and the higher middle SES mean ($M = 8001.4$, $SD = 4269.69$), however the difference between the two middle SES areas was not significant. Tukey HSD revealed that the differences in mean healthy food availability between all three income groups were significant. One way ANOVA also showed significant differences in unhealthy food availability between SES area level ($F = 22.487$, $p < 0.001$), wherein availability increased from 2 kg in low SES households to 8 kg in high middle SES households. Significant differences in unhealthy food availability between income groups ($F = 21.128$, $p < 0.001$) were found; availability rose from 2.4kg in low income households to 5.5kg in high income households. Post-hoc comparison using Tukey HSD revealed that all mean scores differed significantly to one another (between all three SES areas, and between all three income groups).

The only significant difference in food accessibility scores was in unhealthy food accessibility between SES areas ($\chi^2 = 35.5$, $p = 0.000$). Accessibility scores were highest in higher middle SES area households, and lowest in low SES households.

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4.8.4 Food Social Environment

Table 4.8. Descriptive table of the relationship between parental food modelling and child BMI Z-score and WtHR

Parental food modelling item		Childhood BMI Z-score categories			Childhood WtHR categories		
		Underweight /Healthy (n = 97, 46.4%)	Overweight/ Obese (n = 112, 53.6%)	Chi-Square and p value	Healthy (n = 106, 50.7%)	At risk (n = 103, 49.3%)	Chi-Square and p value
Avoidance of Eating Sweets in Presence of Child (N = 209)	Always/Mostly (n = 109, 52.2%)	46 (47.4%)	63 (56.2%)	4.856 (p = 0.088)	53 (50%)	56 (54.4%)	11.818** (p = 0.003)
	Sometimes (n = 48, 23%)	20 (20.6%)	28 (25%)		17 (16%)	31 (30.1%)	
	Rarely/Never (n = 52, 24.8%)	31 (32%)	21 (18.8%)		36 (34%)	16 (15.5%)	
Eating Healthy In Presence of Child (N =209)	Always/Mostly (n = 149, 71.3%)	62 (63.9%)	87 (77.7%)	5.356 (p = 0.069)	76 (71.7%)	73 (70.9%)	1.473 (p = 0.479)
	Sometimes (n = 53, 25.4%)	30 (30.9%)	23 (20.5%)		25 (23.6%)	28 (27.2%)	
	Rarely/Never (n = 7, 3.3%)	5 (5.2%)	2 (1.8%)		5 (4.7%)	2 (1.9%)	

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.8 presents the descriptive findings of the parental food modelling scores. Most caregivers (52.2% of the sample, n = 109) always or mostly avoided consuming sweets in the child's presence. Most caregivers (71.3% of the sample, n = 149) also reported eating healthy all/most of the time in the child's presence. Chi-square tests only found a significant difference between frequency of avoidance of eating sweets and childhood WtHR categories ($\chi^2 = 11.818$, $p = 0.003$), where 34% (n = 36) of healthy WtHR children were from households where parents rarely/never avoided eating sweets in their presence (n = 36) as opposed to 15.5% (n = 16) of at risk children. Moreover, 30.1% (n = 31) of at risk WtHR children were from households where parents reported sometimes avoiding eating sweets in their presence, as opposed to 16% (n = 17) of healthy WtHR children.

Table 4.9. Descriptive table of the relationship between parental food policies and child BMI Z-score and WtHR

Parental food policies item		Childhood BMI Z-score categories: Underweight /Healthy (n = 97, 46.4%)	Childhood BMI Z-score categories: Overweight/ Obese (n = 112, 53.6%)	Childhood BMI Z-score categories: Chi-Square and p value	Childhood WtHR categories: Healthy (n = 106, 50.7%)	Childhood WtHR categories: At risk (n = 103, 49.3%)	Childhood WtHR categories: Chi-Square and p value
Restriction of child's dessert if (s)he doesn't finish the main course (N = 209)	**Always/Mostly (n = 70, 33.5%)**	31 (32%)	39 (34.8%)	14.602** (p = 0.001)	36 (34%)	34 (33%)	0.369 (p = 0832)
	Sometimes (n = 65, 31.1%)	42 (43.3%)	23 (20.5%)		31 (29.2%)	34 (33%)	
	Rarely/Never (n = 74, 35.4%)	24 (24.7%)	50 (44.6%)		39 (36.8%)	35 (34%)	
Rewarding child with more food if plate is finished (N = 209)	**Always/Mostly (n = 80, 38.3%)**	37 (38.1%)	43 (38.4%)	0.034 (p = 0.983)	32 (30.2%)	48 (46.6%)	6.319* (p =0.042)
	Sometimes (n = 57, 27.3%)	26 (26.8%)	31 (27.7%)		31 (29.2%)	26 (25.2%)	
	Rarely/Never (n = 72, 34.4%)	34 (35.1%)	38 (33.9%)		43 (40.6%)	29 (28.2%)	
Allowing child to get seconds if plate is finished (N = 209)	**Always/Mostly (n = 59, 28.2%)**	30 (30.9%)	29 (25.9%)	2.402 (p = 0.301)	27 (25.5%)	32 (31.1%)	4.233 (p = 0.125)
	Sometimes (n = 54, 25.8%)	28 (28.9%)	26 (23.2%)		23 (21.7%)	31 (30.1%)	
	Rarely/Never (n = 96, 45.9%)	39 (40.2%)	57 (50.9%)		56 (52.8%)	40 (38.8%)	
Restricting child's meals to set times (N = 209)	**Always/Mostly (n = 33, 15.8%)**	15 (15.5%)	18 (16.1%)	0.018 (p = 0.991)	19 (17.9%)	14 (13.6%)	0.945 (p = 0.623)
	Sometimes (n = 34, 16.3%)	16 (16.5%)	18 (16.1%)		18 (17%)	16 (15.5%)	
	Rarely/Never (n = 142, 67.9%)	66 (68%)	76 (67.9%)		69 (65.1%)	73 (70.9%)	
Food Amount servings to Child with respect to their own servings (N = 209)	**Same amount (n = 58, 27.8%)**	30 (30.9%)	28 (25%)	2.712 (p = 0.258)	39 (36.8%)	19 (18.4%)	8.811* (p =0.012)
	More (n = 35, 16.7%)	19 (19.6%)	16 (14.3%)		15 (14.2%)	20 (19.4%)	
	Less (n = 116, 55.5%)	48 (49.5%)	68 (60.7%)		52 (49.1%)	64 (62.1%)	

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.9 shows that 38.3% of caregivers (n = 80) always/mostly rewarded the reference child with more food if the child's plate was finished. However, the largest number of caregivers (45.9%, n = 96) rarely/never allowed the child to help themselves to seconds. A large portion of caregivers (67.9%, n = 142) also rarely/never restricted their child's meals to set times. Over one half of caregivers (55%, n = 116) served less portions to their children than themselves.

The only significant difference between children's BMI Z-score categories was found with respect to restriction of dessert if the child does not finish his/her meal ($\chi^2 = 14.602$, $p = 0.001$), where 44.6% (n = 50) of overweight/obese children's caregivers rarely/never restricted dessert as opposed to 24.7% (n = 24) of healthy/underweight children, and where the highest proportion of healthy weight/underweight children's caregivers 'sometimes' restricted dessert (43.3%, n = 42). Significant differences were observed between childhood WtHR categories in two items: the frequency of rewarding their children with more food if plate is finished ($\chi^2 = 6.319$, $p = 0.042$) and the amount of food caregivers served their children in comparison to the portions they served themselves ($\chi^2 = 8.811$, $p = 0.012$). Almost half the caregivers of at risk WtHR children (46.6%, n = 48) always/mostly rewarded them with more food, compared to 30.2% (n = 32) of those with healthy WtHR children. Conversely, 40.6% (n = 43) of caregivers with healthy WtHR children rarely/never rewarded food as opposed to 28.2% (n = 29) of those with at risk children. With respect to food portions, 62.1% (n = 64) of caregivers with at-risk WtHR children served less/smaller portions to their children than to themselves (compared to 49.1% (n =52) of those with healthy WtHR children). Healthy WtHR children were also more likely to have caregivers who served them the same amounts as they did themselves (36.8%, n = 39) than at risk WtHR children (18.4%, n = 19).

Table 4.10. Descriptive data of the relationship between eating/preparation habits scores and child BMI Z-score and WtHR

Eating and preparation habits item		Childhood BMI categories: Underweight /Healthy (n = 97, 46.4%)	Childhood BMI categories: Overweight/ Obese (n = 112, 53.6%)	Childhood BMI categories: Chi-Square and p value	Childhood WtHR categories: Healthy (n = 106, 50.7%)	Childhood WtHR categories: At risk (n = 103, 49.3%)	Childhood WtHR categories: Chi-Square and p value
Having Adequate Space in the Kitchen to Prepare Food (N =209)	**Yes (n = 194, 92.8%)**	87 (89.7%)	107 (95.5%)	2.666 (p = 0.103)	97 (91.5%)	97 (94.2%)	0.557 (p = 0.455)
	No (n = 15, 7.2%)	10 (10.3%)	5 (4.5%)		9 (8.5%)	6 (5.8%)	
Frequency of Family Having Meals at Extended Family Households (N = 209)	**Once a fortnight or more (n = 65, 31.1%)**	22 (22.7%)	43 (38.4%)	6.743* (p = 0.034)	31 (29.2%)	34 (33%)	5.122 (p = 0.077)
	Once monthly on holidays/occasions (n = 107, 51.2%)	58 (59.8%)	49 (43.8%)		50 (47.2%)	57 (55.3%)	
	Once a year/ rarely (n = 37, 17.7%)	17 (17.5%)	20 (17.9%)		25 (23.6%)	12 (11.7%)	
Frequency of Child Eating Breakfasts at Home (N= 209)	**0-2 days a week (n = 67, 32.1%)**	34 (35.1%)	33 (29.5%)	0.874 (p = 0.646)	42 (39.6%)	25 (24.3%)	8.781* (p = 0.012)
	3-5 days a week (n = 15, 7.2%)	6 (6.2%)	9 (8%)		10 (9.4%)	5 (4.9%)	
	6-7 days a week (n = 127, 60.7%)	57 (58.8%)	70 (62.5%)		54 (50.9%)	73 (70.9%)	
Frequency of Child Eating Breakfast at (Pre) School (N= 209)	**0-2 days a week (n = 123, 58.9%)**	57 (58.8%)	66 (58.9%)	0.784 (p = 0.676)	50 (47.2%)	73 (70.9%)	12.837** (p = 0.002)
	3-5 days a week (n = 72, 34.4%)	35 (36.1%)	37 (33%)		46 (43.4%)	26 (25.2%)	
	6-7 days a week (n = 14, 6.7%)	5 (5.2%)	9 (8%)		10 (9.4%)	4 (3.9%)	
Frequency of Families Eating Together at Dinner (N = 209)	**0-2 days a week (n = 4, 1.9%)**	2 (2.1%)	2 (1.8%)	1.870 (p = 0.392)	2 (1.9%)	2 (1.9%)	0.007 (p = 0.997)
	3-5 days a week (n = 24, 11.5%)	8 (8.2%)	16 (14.3%)		12 (11.3%)	12 (11.7%)	
	6-7 days a week (n = 181, 86.6%)	87 (89.7%)	94 (83.9%)		92 (86.8%)	89 (86.4%)	

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.10 revealed that a large majority of households (92.4% of the sample, n = 194) had adequate kitchen space to prepare food. Most families (51.2% of the sample, n = 107) ate at extended family members' homes once monthly or on frequent occasions/holidays (state and religious holidays), while 31.1% (n = 65) ate there once a fortnight or more. The majority of children (60.8% of the sample, n = 127) had breakfasts at home, and most children ate under 2 days of breakfasts at school/preschool (58.9%, n = 123). Family cohesion at dinner time 6-7 days a week was reported in a large majority (86.6% of the sample, n = 181). Families that ate dinner together the least (0-2 days a week) were very few (1.9% of the sample, n = 4). Chi-square test for independence found a significant difference between childhood BMI categories and frequency of eating at extended family ($\chi^2 = 6.743$, $p = 0.034$) where 38.4% (n =43) of overweight/obese children ate at extended family once a fortnight or more compared to 22.7% (n = 22) of healthy/underweight children. WtHR categories differed with respect to frequency of having breakfasts at home ($\chi^2 = 8.781$, $p = 0.012$), where a higher percentage of at-risk WtHR children (70.9%, n = 73) ate breakfast at home 6-7 days a week compared to healthy WtHR children (50.9%, n = 54). Additionally, Chi-square analysis revealed a significant difference in WtHR categories with respect to eating breakfasts at school/pre-school ($\chi^2 = 12.387$, $p = 0.002$), where 43.4% of healthy WtHR children ate at school 3-5 days a week (n = 46) compared to only 25.2% of at risk WtHR children (n = 26).

Table 4.11. Descriptive data of the relationship between TV meals and child BMI Z-score and WtHR

TV meals item		Childhood BMI Z-score categories			Childhood WtHR categories		
		Underweight /Healthy (n = 97, 46.4%)	**Overweight/ Obese (n = 112, 53.6%)**	**Chi-Square and p value**	**Healthy (n = 106, 50.7%)**	**At risk (n = 103, 49.3%)**	**Chi-Square and p value**
Frequency of TV Breakfasts (N = 209)	**0-2 days a week (n = 114, 54.5%)**	52 (53.6%)	62 (55.4%)	0.073 (p = 0.964)	54 (50.9%)	60 (58.3%)	3.237 (p = 0.195)
	3-5 days a week (n =27, 12.9%)	13 (13.4%)	14 (12.5%)		18 (17%)	9 (8.7%)	
	6-7 days a week (n = 68, n = 32.5%)	32 (33%)	36 (32.1%)		34 (32.1%)	34 (33%)	
Frequency of TV Lunches (N = 209)	**0-2 days a week (n =34, 16.3%)**	19 (19.6%)	15 (13.4%)	1.903 (p = 0.386)	14 (13.2%)	20 (19.4%)	1.497 (p = 0.473)
	3-5 days a week (n =33, 15.8%)	13 (13.4%)	20 (17.9%)		17 (16%)	16 (15.5%)	
	6-7 days a week (n = 142, 67.9%)	65 (67%)	77 (68.8%)		75 (70.8%)	67 (65%)	
Frequency of TV Dinners (N = 209)	**0-2 days a week (n = 25, 12%)**	15 (15.5%)	10 (8.9%)	4.425 (p = 0.109)	13 (12.3%)	12 (11.7%)	0.022 (p = 0.989)
	3-5 days a week (n = 26, 12.4%)	8 (8.2%)	18 (16.1%)		13 (12.3%)	13 (12.6%)	
	6-7 days a week (n = 158, 75.6%)	74 (76.3%)	84 (75%)		80 (75.5%)	78 (75.7%)	
Frequency of TV Snacks (N = 209)	**0-2 days a week (n = 85, 40.7%)**	40 (41.2%)	45 (40.2%)	11.130** (p = 0.004)	46 (43.4%)	39 (37.9%)	2.404 (p = 0.301)
	3-5 days a week (n = 38, 18.2%)	26 (26.8%)	12 (10.7%)		15 (14.2%)	23 (22.3%)	
	6-7 days a week (n = 86, 41.1%)	31 (32%)	55 (49.1%)		45 (42.5%)	41 (39.8%)	
TV Viewable from Dining Room (N = 209)	**Yes (n = 175, 83.7%)**	76 (78.4%)	99 (88.4%)	3.848* (p = 0.050)	88 (83%)	87 (84.5%)	0.080 (p = 0.777)
	No (n = 34, 16.3%)	21 (21.6%)	13 (11.6%)		18 (17%)	16 (15.5%)	

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

As seen in Table 4.11, TV breakfasts were rare; over a half of households sampled (54.5%, n = 114) had two or fewer days of TV breakfasts. Frequent TV lunches and dinners (6–7 days a week) were more common (67.9%, n = 142 and 75.6%, n = 118, respectively). Also, 40.7% (n = 85) of children practiced 0-2 days of TV snacks a week, while 41.1% (n = 86) ate TV snacks 6-7 days a week. Chi square tests revealed no significant differences between WtHR categories in any of the items within the TV meals sub-domain. However, there was an association between frequency of TV snack eating and BMI Z-score categories ($\chi^2 = 11.130$, $p = 0.004$), where 49.1% (n = 55) of overweight/obese children indulged in 6-7 days a week of TV snacks compared to 32% (n = 31) of healthy/underweight children. The visibility of a TV from the dining space also displayed significant differences among BMI groups ($\chi^2 = 3.848$, $p = 0.05$), where overweight/obese children were more likely to view the TV from their dining space (88.4%, n = 99) than healthy/underweight children (78.4%, n = 76).

Table 4.12. Correlations between Food Social Environment and Child BMI Z-Score/WtHR

Childhood Weight		Correlation score	p value
BMI Z-score	Vs Parental Food Modelling (Pearson's r)	-0.132	0.056
	Vs Parental Food Policies (Pearson's r)	0.117	0.091
	Vs Eating and Preparation Habits (Spearman's ρ)	0.025	0.721
	Vs TV Meals (Pearson's r)	-0.093	0.180
WtHR	Vs Parental Food Modelling (Pearson's r)	-0.024	0.732
	Vs Parental Food Policies (Pearson's r)	0.007	0.924
	Vs Eating and Preparation Habits (Spearman's ρ)	0.187**	0.007
	Vs TV Meals (Pearson's r)	0.100*	0.037

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.12 shows the correlation analyses between child BMI/WtHR and the sub-domain scores within the food social environment section. Significant correlations were found between WtHR and eating and preparation habits scores (Spearman's rho = 0.187, p = 0.007), as well as TV Meal scores (Pearson's r = 0.100, p = 0.037). For the two significant variables, multivariate analysis was carried out to discover whether the relationships remained significant after controlling for gender, age (model 1) and gender, age and SES area (model 2).

Table 4.13.Difference in food social environment between SES categories

			Mean (SD)	Test Score	p value
Parental Food Modelling Score	Vs SES area (ANOVA) (n = 210)	Low SES (n = 70, 33.3%)	3.36 (1.58)	9.351**	<0.001
		Lower Middle SES (n = 70, 33.3%)	2.71 (1.41)		
		Higher Middle SES (n = 70, 33.3%)	2.29 (1.44)		
	Vs Income (ANOVA) (N = 210)	Low Income (n = 86, 41.1%)	3.36 (1.47)	12.393	<0.001
		Middle Income (n = 89, 42.5%)	2.51 (1.48)		
		High Income (n = 35, 16.7%)	2.09 (1.36)		
Parental Food Policies Score	Vs SES area (ANOVA) (N = 210)	Low SES (n = 70, 33.3%)	16.34 (3.36)	13.471**	<0.001
		Lower Middle SES (n = 70, 33.3%)	13.13 (4.11)		
		Higher Middle SES (n = 70, 33.3%)	13.66 (4.25)		
	Vs Income (ANOVA) (N = 210)	Low Income (n = 86, 41.1%)	14.47 (4.21)	1.533	0.218
		Middle Income (n = 89, 42.5%)	13.91 (3.95)		
		High Income (n = 35, 16.7%)	15.34 (4.48)		
Eating Habits and Preparation Score	Vs SES area (Kruksall–Wallis) (N = 210)	Low SES (n = 70, 33.3%)	Median = 22	7.418*	0.025
		Lower Middle SES (n = 70, 33.3%)	Median = 18		
		Higher Middle SES (n = 70, 33.3%)	Median = 23		
	Vs Income (Kruksall–Wallis) (N = 210)	Low Income (n = 86, 41.1%)	Median = 22	1.945	0.378
		Middle Income (n = 89, 42.5%)	Median = 23		
		High Income (n = 35, 16.7%)	Median = 19		
TV Meals Score	Vs SES area (ANOVA) (N = 210)	Low SES (n = 70, 33.3%)	9.56 (7.82)	1.262	0.285
		Lower Middle SES (n = 70, 33.3%)	11.36 (6.41)		
		Higher Middle SES (n = 70, 33.3%)	10.46 (5.71)		
	Vs Income (ANOVA) (N = 210)	Low Income (n = 86, 41.1%)	11.22 (7.07)	2.048	0.132
		Middle Income (n = 89, 42.5%)	9.37 (6.11)		
		High Income (n = 35, 16.7%)	11.34 (7.09)		

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Three significant differences were found between SES areas in food social environment scores. The first involved parental food modelling scores (t = 9.351, p <0.001) where mean scores decreased with increasing SES area level. Post-hoc Tukey HSD and Bonferroni correction found the low SES area mean parental food modelling score (3.36, SD = 1.58) to be significantly higher than the lower middle (2.71, SD = 1.41) and higher middle (2.29, SD = 1.44) SES areas whereas both middle SES areas did not differ significantly to one another. The second difference was in eating habits and preparation scores (χ^2 = 7.418, p = 0.025), where the higher middle SES areas had the highest (healthiest) scores (Md = 23, mean rank = 121.06). The third significant difference was in parental food policies scores ($t = 13.471$, $p < 0.001$) where the low SES area mean (16.34, SD = 3.36) had significantly higher scores than the lower middle (13.13, SD = 4.11) and higher middle (13.60, SD = 4.25) are

4.8.5 Caregiver Weight Status, Smoking and Sleep

Table 4.14. Descriptive table of the relationship between caregiver weight status, smoking, children's sleep and child BMI Z-score and WtHR

Item		Childhood BMI Z-score categories			Childhood WtHR categories		
		Underweight /Healthy (n = 97, 46.4%)	**Overweight/ Obese (n = 112, 53.6%)**	**Chi-Square and p value**	**Healthy (n = 106, 50.7%)**	**At risk (n = 103, 49.3%)**	**Chi-Square and p value**
Caregiver BMI Categories (N = 209)	**Non Obese (BMI = 18.5-29.9 kg/m²) (n = 115, 55%)**	48 (49.5%)	67 (59.8%)	2.244 (p = 0.134)	.	.	.
	Obese (BMI = 30+ kg/m²) (n = 94, 45%)	49 (50.5%)	45 (40.2%)		.	.	
Caregiver WtHR Categories (N = 209)	**Healthy (<0.5) (n = 57, 27.3%)**	.	.	.	19 (17.9%)	38 (36.9%)	9.476** (p = 0.003)
	At risk (≥0.5) (n = 152, 72.7%)	.	.	.	87 (82.1%)	65 (63.1%)	
Allowing smoking at home (N = 209)	**Yes (n = 146, 69.9%)**	75 (77.3%)	71 (63.4%)	4.788* (p = 0.029)	78 (73.6%)	68 (66%)	1.420 (p = 0.233)
	No (n = 63, 30.1%)	22 (22.7%)	41 (36.6%)		28 (26.4%)	35 (34%)	
Households with at least one smoker (N = 209)	**Yes (n = 75, 35.9%)**	40 (41.2%)	35 (31.2%)	2.253 (p = 0.133)	39 (36.8%)	36 (35%)	0.077 (p = 0.781)
	No (n = 134, 64.1%)	57 (58.8%)	77 (68.8%)		67 (63.2%)	67 (65%)	
Sleep on weekdays (N = 209)	**Under 10 hours (n = 128, n = 61.2%)**	61 (62.9%)	67 (59.8%)	0.206 (p = 0.650)	60 (56.6%)	68 (66%)	1.951 (p = 0.661)
	10 hours or more (n = 81, 38.8%)	36 (37.1%)	45 (40.2%)		46 (43.4%)	35 (34%)	
Sleep on weekends (N = 209)	**Under 10 hours (n = 113, 51.1%)**	57 (58.8%)	56 (50%)	1.607 (p = 0.205)	52 (49.1%)	61 (59.2%)	2.174 (p = 0.140)
	10 hours or more (n = 96, 45.9%)	40 (41.2%)	56 (50%)		54 (50.9%)	42 (40.8%)	

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.14 displays the descriptive data of the caregiver weight status, smoking and sleep section. The majority of caregivers were non-obese (55% of the sample, n = 115). Despite this, raw data revealed that most of the non-obese caregivers were overweight (46.4% of the sample, n = 97). With respect to allowing smoking at home, 69.9% (n = 146) of the sample allowed smoking at home. Despite allowing smoking at home, only 75 households (35.9%) reported having at least one smoker in the household. On both weekdays and weekends, the number of children who slept under 10 hours outnumbered those who slept 10 hours or more. Chi-square test of independence revealed a significant difference between children's WtHR categories with respect to their caregivers' WtHR (χ^2 = 9.476, p = 0.003) where healthy WtHR children were more likely to be from homes with at risk caregivers (82.1%, n = 87). A significant difference was also found between children's BMI categories and allowing smoking at home (χ^2 = 4.788, p = 0.029); households where smoking was not allowed had higher proportions of overweight/obese children (36.6%, n = 41) than healthy/underweight children (22.7%, n = 22).

Table 4.15. Correlations of Caregiver weight status/Smoking/Sleep and Child BMI/WtHR

Childhood Weight		Correlation score	p value
BMI Z-score	Vs Caregiver weight status (BMI) (Pearson's r)	-0.126	0.069
	Vs Smoking (Pearson's r)	0.137	0.059
	Vs Sleep on weekdays (Pearson's r)	-0.021	0.763
	Vs Sleep on weekends (Pearson's r)	0.067	0.332
WtHR	Vs Caregiver weight status (WtHR) (Pearson's r)	-0.077	0.268
	Vs smoking (Pearson's r)	0.131	0.058
	Vs Sleep on weekdays (Pearson's r)	-0.052	0.459
	Vs Sleep on weekends (Pearson's r)	0.002	0.979

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Pearson's correlation analyses (Table 4.15) revealed no significant correlations between BMI and WtHR in terms of caregiver weight status, smoking or sleep duration. Since none of the variables showed a significant relationship, multivariate analysis was not run on these variables to determine the effects of age, gender and SES.

Table 4.16. Differences between caregiver weight status/smoking/sleep and SES categories

Item			Mean (SD)	Test Score	p value
Caregiver Weight Status	Caregiver BMI Vs SES area (ANOVA) (N= 210)	Low SES (n = 70, 33.3%)	28.97 (3.91)	10.831**	<0.001
		Lower Middle SES (n = 70, 33.3%)	32.19 (5.27)		
		Higher Middle SES (n = 70, 33.3%)	29.18 (4.46)		
	Caregiver BMI Vs Income (ANOVA) (N = 210)	Low Income (n = 86, 41.1%)	30.25 (4.63)	0.994	0.372
		Middle Income (n = 89, 42.5%)	30.39 (5.31)		
		High Income (n = 35, 16.7%)	29.08 (3.65)		
	Caregiver WtHR Vs SES area (ANOVA) (N= 210)	Low SES (n = 70, 33.3%)	0.53 (0.06)	9.254**	<0.001
		Lower Middle SES (n = 70, 33.3%)	0.57 (0.09)		
		Higher Middle SES (n = 70, 33.3%)	0.50 (0.11)		
	Caregiver WtHR Vs Income (ANOVA) (N = 210)	Low Income (n = 86, 41.1%)	0.55 (0.08)	4.257*	0.015
		Middle Income (n = 89, 42.5%)	0.53 (0.09)		
		High Income (n = 35, 16.7%)	0.49 (1.00)		
Smoking	Vs SES area (Kruksall-Wallis) (N = 210)	Low SES (n = 70, 33.3%)	Median = 1.00	6.869*	0.032
		Lower Middle SES (n = 70, 33.3%)	Median = 1.00		
		Higher Middle SES (n = 70, 33.3%)	Median = 1.00		
	Vs Income (Kruksall Wallis) (N = 210)	Low Income (n = 86, 41.1%)	Median = 1.00	1.009	0.604
		Middle Income (n = 89, 42.5%)	Median = 1.00		
		High Income (n = 35, 16.7%)	Median = 1.00		
Sleep on weekdays	Vs SES area (ANOVA) (N = 210)	Low SES (n = 70, 33.3%)	557.97 (65.88)	2.304	0.102
		Lower Middle SES (n = 70, 33.3%)	533.43 (66.72)		
		Higher Middle SES (n = 70, 33.3%)	550.64 (75.35)		
	Vs Income (ANOVA) (N = 210)	Low Income (n = 86, 41.1%)	549.33 (70.79)	0.077	0.926
		Middle Income (n = 89, 42.5%)	546.75 (67.99)		
		High Income (n = 35, 16.7%)	544.00 (74.17)		
Sleep on weekends	Vs SES area (ANOVA) (N = 210)	Low SES (n = 70, 33.3%)	585.12 (57.13)	8.556*	<0.001
		Lower Middle SES (n = 70, 33.3%)	532.11 (84.83)		
		Higher Middle SES (n = 70, 33.3%)	545.91 (90.03)		
	Vs Income (ANOVA) (N = 210)	Low Income (n = 86, 41.1%)	554.30 (80.77)	1.912	0.150
		Middle Income (n = 89, 42.5%)	545.50 (80.72)		
		High Income (n = 35, 16.7%)	577.14 (82.94)		

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.16 presents the results of analyses run on caregiver weight status, smoking and sleep scores with respect to SES area/income group. Since all scores displayed a normal distribution, parametric tests (one way ANOVA) were used. Investigation of socio-economic variables revealed significant differences between SES areas in caregiver BMI ($F = 10.831$, $p < 0.001$), caregiver WtHR ($F = 9.254$, $p < 0.001$), smoking scores ($\chi^2 = 6.869$, $p = 0.032$) and in weekend sleep durations ($F = 8.556$, $p < 0.001$). Post-hoc Tukey HSD and Bonferroni correction found lower middle SES area caregiver BMI mean (32.19, SD = 5.27) to be significantly higher than that of higher middle SES (29.18, SD = 4.46) and low SES area (28.97, SD = 3.91); both higher middle and low SES means did not differ significantly to one another. The same pattern was observed for caregiver WtHR means. Moreover, low SES children's weekend sleep mean (585.12, SD = 57.13) was significantly higher than both the lower middle (532.11, SD = 84.83) and higher middle SES (545.92, SD = 90.03) area means; both middle SES areas did not differ significantly from one another.

ANOVA also found significant differences between income categories in caregiver WtHRs ($F = 4.257$, $p = 0.015$). According to both post-hoc Tukey HSD and Bonferroni correction, high income category caregivers had a significantly different WtHR mean (0.49, SD = 1.00) than both low (0.55, SD = 0.08) and middle (0.53, SD = 0.09) income categories. Post-hoc Tukey HSD and Bonferroni correction also revealed that within the smoking scores, the only two SES areas that differed significantly to one another were the low SES area (mean = 1.07, SD = 0.87) and low middle SES area (mean = 0.74, SD = 0.67).

4.8.6 Physical Activity Physical Environment

Table 4.17. Descriptive table of the relationship between outdoor area characteristics

Household Outdoor Area Characteristics Item		Childhood BMI Z-score categories: Underweight /Healthy (n = 97, 46.4%)	Childhood BMI Z-score categories: Overweight/ Obese (n = 112, 53.6%)	Childhood BMI Z-score categories: Chi-Square and p value	Child WtHR categories: Healthy (n = 106, 50.7%)	Child WtHR categories: At risk (n = 103, 49.3%)	Child WtHR categories: Chi-Square and p value
Location of home on a busy street (N = 209)	**Yes (n = 105, 50.2%)**	51 (52.6%)	54 (48.2%)	0.396 (p = 0.529)	54 (50.9%)	51 (49.5%)	0.043 (p = 0.836)
	No (n = 104, 49.8%)	46 (47.4%)	58 (51.8%)		52 (49.1%)	52 (50.5%)	
Proximity to recreational areas (N = 209)	**Yes (n = 125, 59.8%)**	54 (55.7%)	71 (63.4%)	1.290 (p = 0.256)	60 (56.6%)	65 (63.1%)	0.919 (p = 0.338)
	No (n = 84, 40.2%)	43 (44.3%)	41 (36.6%)		46 (43.4%)	38 (36.9%)	
Proximity to gym/sporting areas (N = 209)	**Yes (n = 114, 54.5%)**	50 (51.3%)	64 (57.1%)	1.651 (p = 0.438)	56 (52.8%)	58 (56.3%)	1.375 (p = 0.503)
	No (n = 94, 45%)	47 (48.5%)	47 (42%)		50 (47.2%)	44 (42.7%)	
	Do not Know (n = 1, 0.5%)	0 (0%)	1(0.9%)		0 (0%)	1 (1%)	
Sidewalk presence (N = 209)	**Yes (n = 139, 66.5%)**	63 (64.9%)	76 (67.9%)	0.197 (p = 0.657)	68 (64.2%)	71 (68.9%)	0.536 (p = 0.464)
	No (n = 70, 33.5%)	34 (35.1%)	36 (32.1%)		38 (35.8%)	32 (31.1%)	
Presence of yard (N = 209)	**Yes (n = 110, 52.6%)**	56 (57.7%)	54 (48.2%)	1.889 (p = 0.169)	57 (53.8%)	53 (51.5%)	0.113 (p = 0.737)
	No (n = 99, 47.4%)	41 (42.3%)	58 (51.8%)		49 (46.2%)	50 (48.5%)	
		Underweight/ Healthy (n = 56, 50.9%)	**Overweight/ Obese (n =54, 49.1%)**		**Healthy (n = 57, 51.8%)**	**At risk (n = 53, 48.2%)**	
Yard ('Hosh') size (N = 110)	**Small (n = 36, 32.7%)**	17 (30.4%)	19 (35.2%)	2.015 (p = 0.365)	16(28.1%)	20 (37.7%)	1.514 (p = 0.679)
	Medium (n = 61, 55.4%)	30 (53.6%)	31 (57.4%)		33 (57.9%)	28 (52.8%)	
	Large (n = 13, 11.8%)	9 (16.1%)	4 (7.4%)		8 (14%)	5 (9.4%)	
Having shared yard with other buildings (N = 110)	**Yes (n = 15, 13.6%)**	8 (14.3%)	7 (13%)	0.410 (p = 0.840)	11 (19.3%)	4 (7.5%)	3.329 (p = 0.189)
	No (n = 95, 86.4%)	48 (85.7%)	47 (87%)		46 (80.7%)	49 (92.5%)	
Presence of play equipment in yard ('Hosh') (N = 110)	**Yes (n = 7, 6.4%)**	3 (5.4%)	4 (7.4%)	0.194 (p = 0.660)	6 (10.5%)	1 (1.9%)	3.459 (p = 0.170)
	No (n = 103, 93.6%)	53 (94.6%)	50 (48.5%)		51 (89.5%)	52 (98.1%)	

		Underweight /Healthy (n = 97, 46.4%)	Overweight/ Obese (n = 112, 53.6%)		Healthy (n = 106, 50.7%)	At risk (n = 103, 49.3%)	
Ownership of tricycle (N = 209)	Yes (n = 31, 14.8%)	17 (17.5%)	14 (12.5%)	1.039 (p = 0.308)	14 (13.2%)	17 (16.5%)	0.450 (p = 0.503)
	No (n = 178, 85.2%)	80 (82.5%)	98 (87.5%)		92 (86.8%)	86 (83.5%)	
Ownership of bicycle (N = 209)	Yes (n = 52, 24.9%)	16 (16.5%)	36 (32.1%)	6.810** (p = 0.009)	29 (27.4%)	23 (22.3%)	0.707 (p = 0.401)
	No (n = 157, 75.1%)	81 (83.5%)	76 (67.9%)		77 (72.6%)	80 (77.7%)	
Ownership of scooter (N = 209)	Yes (n = 28, 13.4%)	14 (14.4%)	14 (12.5%)	0.167 (p = 0.682)	19 (17.9%)	9 (8.7%)	3.860 (p = 0.051)
	No (n = 181, 86.6%)	83 (85.6%)	98 (87.5%)		87 (82.1%)	94 (91.3%)	
Ownership of other wheeled toys (N = 209)	Yes (n = 19, 9.1%)	11 (11.3%)	8 (7.1%)	1.108 (p = 0.292)	11 (10.4%)	8 (7.8%)	0.431 (p = 0.512)
	No (n = 190, 90.9%)	86 (88.7%)	104 (92.9%)		95 (89.6%)	95 (92.2%)	

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.17 presents the descriptive data of the PA physical environment section of this study's theoretical model. One half of households (50.2%, n = 105) reported living on busy streets, while 59.8% (n = 125) reported being close to recreational areas. Gyms and sporting centres were close to 54.5% (n = 114) of the sample, while usable sidewalks were found on streets of 66.5% (n = 139) of the sample. One hundred and ten households reported having a yard/hosh; of those, 55.4% (n = 61) were medium sized, 86.4% (n = 95) were not shared with other houses and 93.6% (n = 103) did not have any play equipment. Most of the sample did not own any of the wheeled toys mentioned in the HHS, including tricycles (85.2%, n = 178), bicycles (75.1%, n = 157), scooters (86.6%, n = 181) and other wheeled toys (90.9%, n = 190). Chi-square test for independence revealed only one statistically significant association, which was between BMI Z-score categories and ownership of bicycles (χ^2 = 6.810, p = 0.009): overweight/obese children were more likely to own bicycles than their healthy counterparts (32.1%, n = 36 compared to 16.5%, n = 16, respectively).

Table 4.18. Descriptive table of the relationship between media availability at home and child BMI Z-score and WtHR

Media Availability Item (Ownership of media)		Childhood BMI Z-score categories			Childhood WtHR categories		
		Underweight /Healthy (n = 97, 46.4%)	**Overweight/ Obese (n = 112, 53.6%)**	**Chi-Square and p value**	**Healthy (n = 106, 50.7%)**	**At risk (n = 103, 49.3%)**	**Chi-Square and p value**
Television (N = 209)	**Yes (n = 209, 100%)**	**97 (100%)**	**112 (100%)**	.	106 (100%)	103(100%)	.
	No (n = 0)	0 (0%)	0 (0%)		0 (0%)	0 (0%)	
Television in Child's Bedroom (N = 209)	**Yes (n = 24, 11.5%)**	12 (12.4%)	12 (10.7%)	0.140 (p = 0.780)	15 (14.2%)	9 (8.7%)	1.506 (p = 0.220)
	No (n = 185, 88.5%)	85 (87.6%)	100 (89.3%)		91 (85.8%)	94 (91.3%)	
Cable/Satellite (N = 209)	**Yes (n = 198, 94.7%)**	90 (92.8%)	108 (96.4%)	1.385 (p = 0.239)	98 (92.5%)	100 (97.1%)	2.250 (p = 0.134)
	No (n = 11, 5.3%)	7 (7.2%)	4 (3.6%)		8 (7.5%)	3 (2.9%)	
DVD/Video Player (N = 209)	**Yes (n = 49, 23.4%)**	16 (16.5%)	33 (29.5%)	4.871 * (p = 0.027)	23 (21.7%)	26 (25.2%)	0.366 (p = 0.545)
	No (n = 160, 76.6%)	81 (83.5%)	79 (70.5%)		83 (78.3%)	77 (74.8%)	
Child's videotapes (N = 209)	**Yes (n = 18, 8.6%)**	5 (5.2%)	13 (11.6%)	2.750 (p = 0.097)	9 (8.5%)	9 (8.7%)	0.004 (p = 0.949)
	No (n = 191, 91.4%)	92 (94.8%)	99 (88.4%)		97 (91.5%)	94 (91.3%)	
Computer/ Laptop (N = 209)	**Yes (n = 145, 69.4%)**	66 (68%)	79 (70.5%)	0.152 (p = 0.696)	77 (72.6%)	68 (66%)	1.078 (p = 0.299)
	No (n = 64, 30.6%)	31 (32%)	33 (29.5%)		29 (27.4%)	35 (34%)	
Computer/Laptop in Child's Bedroom (N = 209)	**Yes (n = 26, 12.4%)**	13 (13.4%)	13 (11.6%)	0.154 (p = 0.695)	15 (14.2%)	11 (10.7%)	0.578 (p = 0.447)
	No (n = 183, 87.6%)	84 (86.6%)	99 (88.4%)		91 (85.8%)	92 (89.3%)	
Video game consoles (N = 209)	**Yes (n = 13, 6.2%)**	6 (6.2%)	7 (6.2%)	0.000 (p = 0.985)	8 (7.5%)	5 (4.9%)	0.649 (p = 0.420)
	No (n = 196, 93.8%)	91 (93.8%)	105 (93.8%)		98 (92.5%)	98 (95.1%)	
Video game consoles in Child's Bedroom (N = 209)	**Yes (n = 6, 2.9%)**	0 (0%)	6 (5.4%)	5.350* (p = 0.021)	3 (2.8%)	3 (2.9%)	0.001 (p = 0.972)
	No (n = 203, 97.1%)	97 (100%)	106 (94.6%)		103 (97.2%)	100 (97.1%)	

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.18 shows that all households had TV sets at home, but only 11.5% (n = 24) had TV sets in the reference child's room. Most households owned cable/satellite packages (94.7%, n = 198), but most did not own DVD/Video players (76.6%, n = 160) or child videotapes (91.4%, n = 191). A large number of households owned computers/laptops (67%, n = 140), but few had computers/laptops in the child's bedroom (87.6%, n = 183). Numbers of households that owned TVs and computer/laptops in the child's bedrooms were low (11.5%, n = 24 and 12.4%, n = 26, respectively). Households that owned videogame consoles were also very rare (6.2%, n = 13). Only 2.9% (n = 6) of households owned videogame consoles in the child's bedroom. Chi-square tests found two significant differences between BMI Z-score categories. Healthy/underweight children were more likely to be living in households without DVD's/video players (83.5%, n = 81) than overweight/obese children (70.5%, n = 79) ($\chi^2 = 4.871$, $p = 0.027$). In all six of the households that kept a videogame console in the child's bedroom, the reference child was overweight/obese ($\chi^2 = 5.350$, $p = 0.021$).

Table 4.19. Correlations of PA physical environment and Childhood BMI Z-score/WtHR

Childhood Weight		Correlation score	P value
BMI Z-score	Vs Outdoor Area Characteristics Score (Pearson's r)	0.031	0.660
	Vs Media Availability at Home Score (Pearson's r)	-0.006	0.936
WtHR	Vs Outdoor Area Characteristics Score (Pearson's r)	-0.083	0.229
	Vs Media Availability at Home Score (Pearson's r)	0.009	0.900

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.19 shows that none of the PA physical environment scores were significantly correlated with both childhood weight scores after running Pearson's correlation analyses. Since none of the variables showed any significant relationships, multivariate analysis was not used.

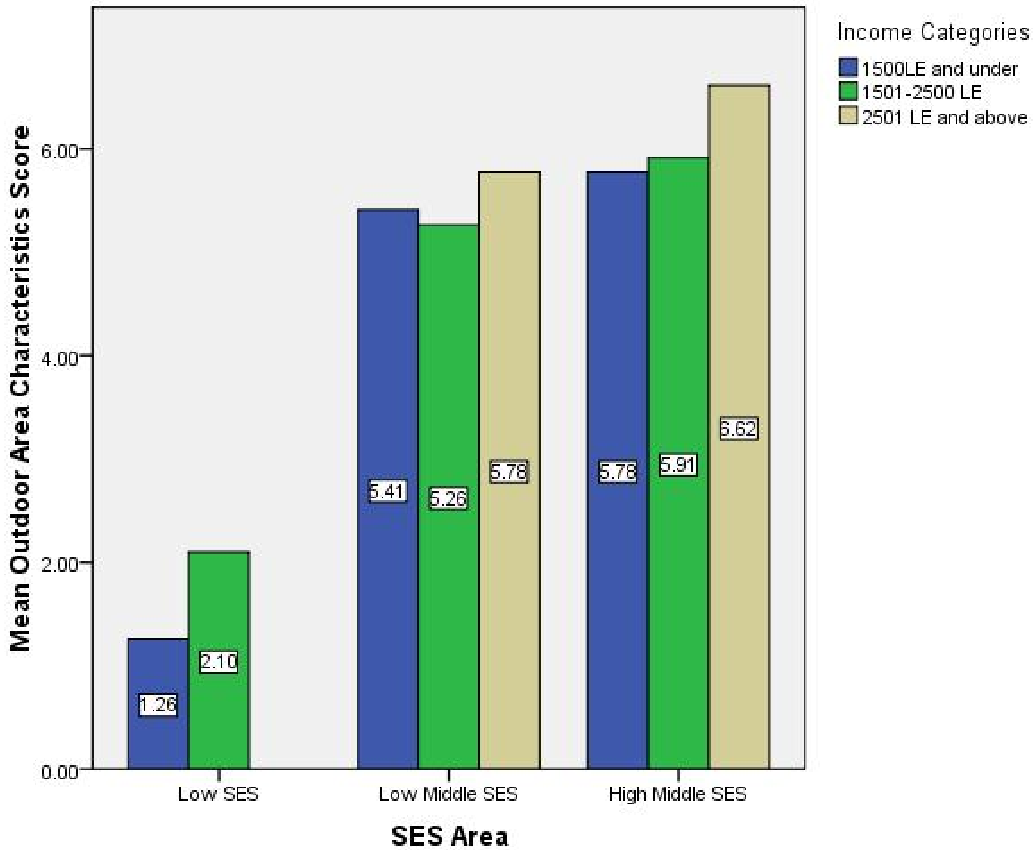
Table 4.20. Differences in PA physical environment between SES categories

PA Social Environment item			Mean (SD)	Test Score	p value
Outdoor Area Characteristics Score	Vs SES area (ANOVA) (N = 210)	Low SES (n = 70, 33.3%)	1.50 (1.57)	23.313**	<0.001
		Lower Middle SES (n = 70, 33.3%)	1.71 (0.20)		
		Higher Middle SES (n = 70, 33.3%)	2.11 (0.25)		
	Vs Income (ANOVA) (N = 210)	Low Income (n = 86, 41.1%)	3.03 (2.68)	26.362**	<0.001
		Middle Income (n = 89, 42.5%)	4.81 (2.40)		
		High Income (n = 35, 16.7%)	6.40 (1.88)		
Media Availability at Home Score	Vs SES area (ANOVA) (N = 210)	Low SES (n = 70, 33.3%)	2.71 (1.08)	17.074**	<0.001
		Lower Middle SES (n = 70, 33.3%)	3.22 (0.85).		
		Higher Middle SES (n = 70, 33.3%)	3.92 (1.64)		
	Vs Income (ANOVA) (N = 210)	Low Income (n = 86, 41.1%)	2.72 (1.08)	20.868**	<0.001
		Middle Income (n = 89, 42.5%)	3.47 (1.28)		
		High Income (n = 35, 16.7%)	4.23 (1.35)		

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.20 displays the results of parametric tests run between SES area/income categories and both PA physical environment sub-domain scores (continuous). One way ANOVA found significant differences between SES area groups and between income groups in both sub-domain scores. All three SES areas differed significantly with one another with respect to outdoor area characteristics scores (even after adjustment with Tukey HSD and Bonferroni correction), which increased (were healthier) with increasing SES area level (see Fig.4.10 below). The same pattern was observed with media item availability scores; the higher the SES area level, the more the media items at home. Post-hoc tests (Tukey HSD and Bonferroni correction) also showed that income groups differed significantly between one another in outdoor area characteristics scores, where the higher the income group, the higher the outdoor area characteristic score. The same result was found in media availability at home scores, where availability scores increased with increasing income.

Figure 4.10. Outdoor area characteristics Vs SES area and Income



4.8.7 Physical Activity Social Environment

Table 4.21. Descriptive table of the relationship between active play allowance, parental PA modelling and child BMI Z-score and WtHR

Active Play Allowance		Childhood BMI Z-score categories			Childhood WtHR categories		
		Underweight/ Healthy (n = 96, 46.2%)	**Overweight/ Obese (n =112, 53.8%)**	**Chi-Square and p value**	**Healthy (n = 106, 51%)**	**At Risk (n = 102, 49%)**	**Chi-Square and p value**
Restriction of active play indoors (N = 208)	**Always/Mostly (n = 104, 50%)**	39 (40.6%)	65 (58%)	13.149** (p = 0.001)	51 (48.1%)	53 (52%)	1.118 (p = 0.572)
	Sometimes (n = 43, 20.7%)	17 (17.7%)	26 (23.2%)		25 (23.6%)	18 (17.6%)	
	Rarely/Never (n = 61, 29.3%)	40 (41.7%)	21 (18.8%)		30 (28.3%)	31 (30.4%)	
Restriction of active play in yards (N = 108)		**Underweight/ Healthy (n = 66, 52.4%)**	**Overweight/ Obese (n =60, 47.6%)**		**Healthy (n =56, 51.9%)**	**At Risk (n = 52, 48.1%)**	
	Always/Mostly (n = 36, 33.3%)	21 (38.2%)	15 (28.3%)	2.545 (p = 0.281)	23 (41.1%)	13 (25%)	3.134 (p = 0.209)
	Sometimes (n = 35, 32.4%)	19 (34.5%)	16 (30.2%)		16 (28.6%)	19 (36.5%)	
	Rarely/Never (n = 37, 34.3%)	15 (27.3%)	22 (41.5%)		17 (30.4%)	20 (38.5%)	
Restriction of active play in the immediate neighbourhood (N = 177)		**Underweight/ Healthy (n = 85, 48%)**	**Overweight/ Obese (n =92, 52%)**		**Healthy (n = 88, 49.7%)**	**At Risk (n = 89, 50.3%)**	
	Always/Mostly (n = 34, 19.2%)	24 (28.2%)	10 (10.9%)	8.987* (p = 0.011)	16 (18.2%)	18 (20.2%)	3.647 (p = 0.161)
	Sometimes (n = 36, 20.3%)	17 (20%)	19 (20.7%)		23 (26.1%)	13 (14.6%)	
	Rarely/Never (n = 107, 60.5%)	44 (51.8%)	63 (61.5%)		49 (55.7%)	58 (65.2%)	

		Underweight /Healthy (n = 97, 46.4%)	Overweight/ Obese (n = 112, 53.6%)		Healthy (n = 106, 50.7%)	At Risk (n = 103, 49.3%)	
Frequency of extended family members allowing outdoor play when child was entrusted to them (N = 209)	Always/Mostly (n = 6, 2.9%)	5 (83.3%)	1 (16.7%)	3.758 (p = 0.153)	5 (4.7%)	1 (1%)	7.903* (p = 0.029)
	Sometimes (n = 77, 36.8%)	37 (48.1%)	40 (51.9%)		31 (29.2%)	46 (44.7%)	
	Rarely/Never (n = 126, 60.3%)	55 (43.7%)	71 (56.3%)		70 (66%)	56 (54.4%)	
Parental PA Modelling							
Caregiver's Engagement in Physical Exercise (N = 209)	Yes (n = 21, 10%)	8 (8.2%)	13 (11.6%)	0.649 (p = 0.420)	13 (12.3%)	8 (7.8%)	1.169 (p = 0.280)
	No (n = 188, 90%)	89 (91.8%)	99 (88.4%)		93 (87.7%)	95 (92.2%)	
Caregiver's frequency of being active in presence of the child (N = 209)	Always/Mostly (n = 107, 51.2%)	35 (36.1%)	72 (64.3%)	16.941** (p <0.001)	51 (48.1%)	56 (54.4%)	1.078 (p = 0.583)
	Sometimes (n = 87, 41.6%)	54 (55.7%)	33 (29.5%)		46 (43.3%)	41 (39.8%)	
	Rarely/Never (n = 15, 7.2%)	8 (8.2%)	7 (6.2%)		9 (8.5%)	6 (5.8%)	
Households having at least one gym member (N = 209)	Yes (n = 22, 10.5%)	7 (7.2%)	15 (13.4%)	2.11 (p = 0.15)	11 (10.4%)	11 (10.7%)	0.005 (p = 0.943)
	No (n = 187, 89.5%)	90 (92.8%)	97 (86.6%)		95 (89.6%)	92 (89.3%)	

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.21 displays the descriptive data from two of the four PA social environment sub-domains; active play allowance and parental PA modelling. Half of caregivers (50%, n = 104) always/mostly restricted active play indoors, 20.7% (n = 43) sometimes did and 29.3% (n = 61) rarely/never did. Many parents (60.5%, n = 107) rarely/never restricted active play in the neighbourhood. When children were entrusted to extended family members, a large number of those extended family members (60.3%, n = 126) rarely/never allowed children to play outdoors. In terms of parental PA modelling, most caregivers (90%, n = 188) did not engage in physical exercise, although most of them (51.2%, n = 107) reported always/mostly being active in the presence of the reference child. Most households did not have a gym member (89.5%, n = 187).

Chi-square test for independence revealed significant associations between BMI Z-score categories and three of the items: restriction of active play indoors ($\chi^2 = 13.149$, $p = 0.001$), restriction of active play in the immediate neighbourhood ($\chi^2 = 8.987$, $p = 0.011$), in the frequency of being active in the presence of the reference child ($\chi^2 = 16.941$, $p < 0.001$). Healthy/underweight children were more likely to be from homes which rarely/never restricted active play indoors (41.7%, n = 40) as opposed to overweight/obese children (18.8%, n = 21). Overweight/obese children were more likely to be from households that rarely/never restricted active play in the neighbourhood (61.5%, n 63) than healthy/underweight children (51.8%, n = 44). Also, overweight/obese children were more likely to be in households where parents reported almost/mostly being active in the reference child's presence (64.3%, n = 72), while healthy/underweight children were more likely to be in households where caregivers reported sometimes being active (55.7%, n = 54). Chi-square tests also revealed a significant association between WtHR categories in the frequency of extended family's allowance of active play in the neighbourhood when children are entrusted to them ($\chi^2 = 7.903$, $p = 0.029$). Healthy WtHR children's extended family were very restrictive (66%, n = 70) while 44.7% (n = 46) of at-risk WtHR children had extended family members who were sometimes restrictive in allowing outdoor active play.

Table 4.22. Descriptive table of the relationship between media restrictions and child BMI Z-score and WtHR

Media Restriction Item		Childhood BMI Z-score categories			Childhood WtHR categories		
		Underweight /Healthy (n = 97, 46.4%)	**Overweight/ Obese (n = 112, 53.6%)**	**Chi-square and p Value**	**Healthy (n = 106, 51%)**	**At Risk (n = 102, 49%)**	**Chi-square and p Value**
Frequency of TV restriction (N = 209)	**Always/Mostly (n = 85, 40.7%)**	39 (40.2%)	46 (41.1%)	0.114 (p = 0.945)	45 (42.5%)	40 (38.8%)	0.865 (p = 0.649)
	Sometimes (n = 73, 34.9%)	35 (36.1%)	38 (33.9%)		38 (35.8%)	35 (34%)	
	Rarely/Never (n = 51, 24.4%)	23 (23.7%)	28 (25%)		23 (21.7%)	28 (27.2%)	
Frequency of computer/laptop restriction (N =144)		**Underweight/ Healthy (n = 68, 47.2%)**	**Overweight/ Obese (n = 76, 52.8 %)**		**Healthy (n = 77, 53.5%)**	**At Risk (n = 67, 46.5%)**	
	Always/Mostly (n = 39, 27.1%)	17 (25%)	22 (28.9%)	1.975 (p = 0.373)	22 (28.6%)	17 (25.4%)	2.833 (p = 0.243)
	Sometimes (n = 57, 39.6%)	31 (45.6%)	26 (34.2%)		34 (44.2%)	23 (34.3%)	
	Rarely/Never (n = 48, 33.3%)	20 (29.4%)	28 (38.6%)		21 (27.3%)	27 (40.3%)	
Frequency of videogame restriction (N = 18)		**Underweight/ Healthy (n = 6, 50%)**	**Overweight/ Obese (n = 6, 50%)**		**Healthy (n =9, 50%)**	**At Risk (n = 9, 50%)**	
	Always/Mostly (n = 5, 27.8%)	0 (0%)	5 (45.5%)	3.864 (p = 0.145)	3 (33.3%)	2 (25%)	0.142 (p = 0.932)
	Sometimes (n = 3, 16.7%)	2 (16.7%)	1 (9.1%)		1 (11.1%)	2 (12.5%)	
	Rarely/Never (n =10, 55.5%)	5 (83.3%)	5 (45.5%)		5 (55.6%)	5 (62.5%)	

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

With respect to media restriction scores, households that did not own a certain media item did not respond to the question regarding restricting/rewarding using that particular media item, which may skew results in favour of households that own all media items in the survey. On examining the data, 144 households were eligible to answer the computer restriction question, and only 18 owned videogames at home. This may skew results with respect to videogame restriction (and subsequently rewards) as this sample is quite small. When asked about media restriction, 40.7% (n = 85) always/mostly restricted TV usage. Also, 39.6% (n = 57) of households with computers/laptops sometimes restricted the reference child's usage. Over one half of households that owned videogames (55.5%, n = 10) rarely/never restricted usage. Chi-square tests found no significant associations between BMI Z-score categories and WtHR categories in media restriction.

Table 4.22. Descriptive table of the relationship between media rewards and BMI Z-score and WtHR

Media Rewards Item		Childhood BMI Z-score categories			Childhood WtHR categories		
		Underweight /Healthy (n = 97, 46.4%)	**Overweight/ Obese (n = 112, 53.6%)**	**Chi-square and p Value**	**Healthy (n = 106, 51%)**	**At Risk (n = 102, 49%)**	**Chi-square and p Value**
TV rewards frequency (N = 209)	**Always/Mostly (n = 63, 30.1%)**	29 (29.9%)	34 (30.4%)	1.259 (p = 0.533)	35 (33%)	28 (27.2%)	1.468 (p = 0.480)
	Sometimes (n = 83, 39.7%)	42 (43.3%)	41 (36.6%)		38 (35.8%)	45 (43.7%)	
	Rarely/Never (n = 63, 30.1%)	26 (26.8%)	37 (33%)		33 (31.1%)	30 (29.1%)	
Computer/ laptop rewards frequency (N = 145)		**Underweight /Healthy (n = 68, 46.9%)**	**Overweight/ Obese (n = 77, 53.1%)**		**Healthy (n = 77, 53.5%)**	**At Risk (n = 67, 46.5%)**	
	Always/Mostly (n = 35, 24.1%)	17 (25%)	18 (23.4%)	0.134 (p = 0.935)	16 (21.1%)	19 (27.5%)	3.422 (p = 0.181)
	Sometimes (n = 62, 42.8%)	28 (41.2%)	34 (44.2%)		38 (50%)	24 (34.8%)	
	Rarely/Never (n = 48, 33.1%)	23 (33.8%)	25 (32.5%)		22 (28.9%)	26 (37.7%)	
Videogame rewards frequency (N = 17)		**Underweight/ Healthy (n = 6, 35.3%)**	**Overweight/ Obese (n = 11, 64.7%)**		**Healthy (n =10, 58.8%)**	**At Risk (n = 7, 41.2%)**	
	Always/Mostly (n = 3, 17.6%)	1 (16.7%)	2 (18.2%)	2.821 (p = 0.244)	2 (20%)	1 (14.3%)	0.093 (p = 0.955)
	Sometimes (n = 7, 41.2%)	1 (16.7%)	6 (54.5%)		4 (40%)	3 (42.9%)	
	Rarely/Never (n = 7, 41.2%)	4 (66.7%)	3 (27.3%)		4 (40%)	3 (42.9%)	

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.22 shows descriptive results of media rewards items. As with the media restriction scores, the numbers of households with all three media items at home might lesser numbers of households owning computers and videogame consoles may skew results as they (in particular videogames) are an extremely small sample. The table shows that 39.7%

(n = 83) of caregivers sometimes rewarded children's good behaviour with television. Also, 42.8% (n = 62) of caregivers sometimes rewarded children with computer usage, while 41.2% (n = 7) sometimes used videogame rewards. These results show that caregivers practice moderate rewarding of media items. Chi-squared tests revealed no significant associations between BMI Z-score categories and WtHR categories in restriction frequencies.

Table 4.23. Correlations of PA social environment and Child BMI Z-score/WtHR

Childhood Weight		Correlation score	p value
BMI Z-score	**Vs Parental PA Modelling score (Pearson's r)**	0.224**	0.001
	Vs Active Play Allowance score (Pearson's r)	-0.021	0.768
	Vs Media Restriction score (Pearson's r)	-0.003	0.960
	Vs Media Rewards score (Pearson's r)	-0.030	0.664
WtHR	**Vs Parental PA Modelling score (Pearson's r)**	0.049	0.481
	Vs Active Play Allowance score (Pearson's r)	-0.011	0.874
	Vs Media Restriction score (Pearson's r)	-0.145*	0.037
	Vs Media Rewards score (Pearson's r)	-0.116*	0.037

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

With respect to all PA social environment scores, parental PA modelling scores had a significant positive relationship with children's BMI Z-scores (Pearson's r = 0.224, p = 0.001) as seen in Table 4.23, indicating that the greater the reported parental PA, the greater the child's BMI Z-score. Moreover, further correlation analyses revealed that parental PA modelling was positively correlated with both PA on weekdays (Pearson's r = 0.245, p = 0.000) and on weekends (Pearson's r = 0.320, p = 0.000). Significant relationships were also found between WtHR and using media restrictions (Pearson's r = -0.145, p = 0.037) and media rewards (Pearson's r = -0.116, p = 0.037).

Table 4.24. Differences in PA social environment between SES categories

PA Social Environment item			Mean (SD)	Test Score	p value
Parental PA Modelling Score	Vs SES area (ANOVA) (N = 210)	Low SES (n = 70, 33.3%)	2.64 (0.93)	5.334**	0.006
		Lower Middle SES (n = 70, 33.3%)	2.51 (0.89)		
		Higher Middle SES (n = 70, 33.3%)	3.04 (1.15)		
	Vs Income (ANOVA) (N = 210)	Low Income (n = 86, 41.1%)	2.43 (0.93)	13.382**	<0.001
		Middle Income (n = 89, 42.5%)	2.75 (0.96)		
		High Income (n = 35, 16.7%)	3.42 (1.04)		
Active Play Allowance Score	Vs SES area (ANOVA) (N = 210)	Low SES (n = 70, 33.3%)	5.43 (2.89)	12.066**	<0.001
		Lower Middle SES (n = 70, 33.3%)	7.67 (2.39)		
		Higher Middle SES (n = 70, 33.3%)	6.76 (2.84)		
	Vs Income (ANOVA) (N = 210)	Low Income (n = 86, 41.1%)	6.43 (3.15)	0.482	0.618
		Middle Income (n = 89, 42.5%)	6.84 (2.60)		
		High Income (n = 35, 16.7%)	6.51 (2.77)		
Media Restriction Score	Vs SES area (ANOVA) (N = 210)	Low SES (n = 70, 33.3%)	4.17 (1.69)	6.242**	0.002
		Lower Middle SES (n = 70, 33.3%)	4.90 (0.92)		
		Higher Middle SES (n = 70, 33.3%)	4.19 (1.46)		
	Vs Income (ANOVA) (N = 210)	Low Income (n = 86, 41.1%)	4.77 (1.29)	4.520*	0.012
		Middle Income (n = 89, 42.5%)	4.20 (1.58)		
		High Income (n = 35, 16.7%)	4.11 (1.16)		
Media Rewards Score	Vs SES area (ANOVA) (N = 210)	Low SES (n = 70, 33.3%)	1.49 (0.50)	6.802**	0.001
		Lower Middle SES (n = 70, 33.3%)	1.77 (0.42)		
		Higher Middle SES (n = 70, 33.3%)	1.56 (1.46)		
	Vs Income (ANOVA) (N = 210)	Low Income (n = 86, 41.1%)	1.57 (1.30)	0.706	0.495
		Middle Income (n = 89, 42.5%)	1.65 (0.47)		
		High Income (n = 35, 16.7%)	1.57 (0.50)		

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

PA social environment scores, which displayed normal distributions, were subjected to parametric analyses (shown in table 4.24). One way ANOVA found significant differences between SES area groups in parental PA modelling scores (F = 5.334, p = 0.006), active play allowance scores (F = 12.066, p < 0.001), media restriction (F = 6.242, p = 0.002) and media rewards scores (F = 6.802, p = 0.001). Post-hoc Tukey and Bonferroni correction revealed that the higher middle SES area PA modelling mean (3.42, SD = 1.04) was significantly higher than low SES (2.64, SD = 0.93) and lower middle SES (2.51, SD = 0.89) means. Low SES area play allowance mean (5.34, SD = 2.89) was significantly lower than both lower middle SES

(7.67, SD = 2.39) and higher middle SES (6.76, SD = 2.84) means. Lower middle SES area media restriction mean (4.90, SD = 0.92) was significantly higher than both low SES (4.17, SD = 1.69) and higher middle SES (4.19, SD = 1.46). The lower middle SES reward mean (1.77, SD = 0.42) was also significantly more moderate than low SES (1.49, SD = 0.50) and higher middle SES (1.56, SD = 1.46) means.

One way ANOVA analyses found a significant difference between income groups in parental PA modelling scores ($F = 13.382$, $p < 0.001$) and in media restriction scores ($F = 4.520$, $p = 0.012$). Post-hoc Tukey and Bonferroni correction found the high income group PA modelling mean (3.42, SD = 1.04) to be significantly higher than both middle (2.75, SD = 0.96) and low (2.43, SD = 0.93) groups. Post- hoc tests also revealed low income group restriction mean (4.77, SD = 1.29) was significantly higher/more moderate than middle (4.20, SD = 1.58) and high (4.11, SD = 1.16) income group means.

4.8.8 Physical Activity Levels

Table 4.25. Descriptive table of the relationship between PA/SA levels and child BMI Z-score and WtHR

PA/SA Item		**Childhood BMI Z-score categories**			**Childhood WtHR categories**		
		Underweight/ Healthy (n = 96, 46.2%)	**Overweight/ Obese (n = 112, 53.8%)**	**Chi-square and p value**	**Healthy (n = 106, 50.7%)**	**At risk (n = 103, 49.3%)**	**Chi-square and p value**
Moderate/ Vigorous Activity on a weekday (min/day) (N = 208)	**Under 60 minutes (n = 40, 19.2%)**	25 (26%)	15 (13.4%)	5.235* (p = 0.021)	20 (19%)	20 (19.4%)	0.000 (p = 0.999)
	60 minutes or more (n = 168, 80.8%)	71(74%)	97 (86.6%)		85 (81%)	83 (80.6%)	
Moderate/ Vigorous activity on a weekend (min/day) (N = 209)		**Underweight/ Healthy (n = 97, 46.4%)**	**Overweight/ Obese (n = 112, 53.6%)**		**Healthy (n = 106, 50.7%)**	**At risk (n = 103, 49.3%)**	
	Under 60 minutes (n = 40, 19.1%)	25 (25.8%)	15 (13.4%)	5.148* (p = 0.023)	20 (18.9%)	20 (19.4%)	0.010 (p = 0.920)
	60 minutes or more (n = 169, 80.9%)	72 (74.2%)	34 (86.6%)		86 (81.1%)	83 (80.6%)	
Sedentary Activity on a weekday (N = 208)		**Underweight/ Healthy (n = 96, 46.2%)**	**Overweight/ Obese (n = 112, 53.8%)**		**Healthy (n = 106, 50.7%)**	**At risk (n = 103, 49.3%)**	
	3 hours and under (n = 113, 54.3%)	43 (44.8%)	70 (62.5%)	6.533* (p = 0.011)	42 (40%)	71 (68.9%)	16.394** (p < 0.001)
	More than 3 hours (n = 95, 45.7%)	53(55.2%)	42 (37.5%)		63 (60%)	32 (31.1%)	
Sedentary Activity on a weekend (N = 208)	**3 hours and under (n = 91, 43.8%)**	37 (38.5%)	54 (48.2%)	1.965 (p = 0.161)	27 (25.7%)	64 (62.1%)	28.027** (p < 0.001)
	More than 3 hours (n = 117, 56.2%)	59 (61.5%)	58 (51.8%)		78 (74.3%)	39 (37.9%)	

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Data revealed that the majority of children did more than the recommended levels of moderate/vigorous activity (60 minutes a day) on both weekdays (80.8% of the sample, n = 168) and weekends (81.3% of the sample, n = 169). If split by gender, 82.7% of boys and 78.4% of girls met PA recommendations. This is high compared to recent UK data (Townsend, Bhatnagar, Wickramasinghe, Scarborough, & Foster, 2012) which revealed that only 32% of boys aged 2-15 and 24% of girls aged 2-15 met PA recommendations. Most children (54.3% of the sample, n = 113) had 3 hours or less of SA on weekdays. The opposite was true in weekends; 56.3% of the sample (n = 117) practised over 3 hours of SA on average on weekends. Chi-square tests revealed significant associations between BMI Z-score categories in weekday and weekend PA levels, where higher proportions of overweight/obese children practiced 60 minutes or more of moderate/vigorous PA on both weekdays and weekends. Chi-square tests found significant differences among both WtHR and BMI Z-score categories in weekday SA levels, where higher proportions of overweight/obese children reported under 3 hours of SA.

Table 4.26. PA & SA levels Vs SES variables

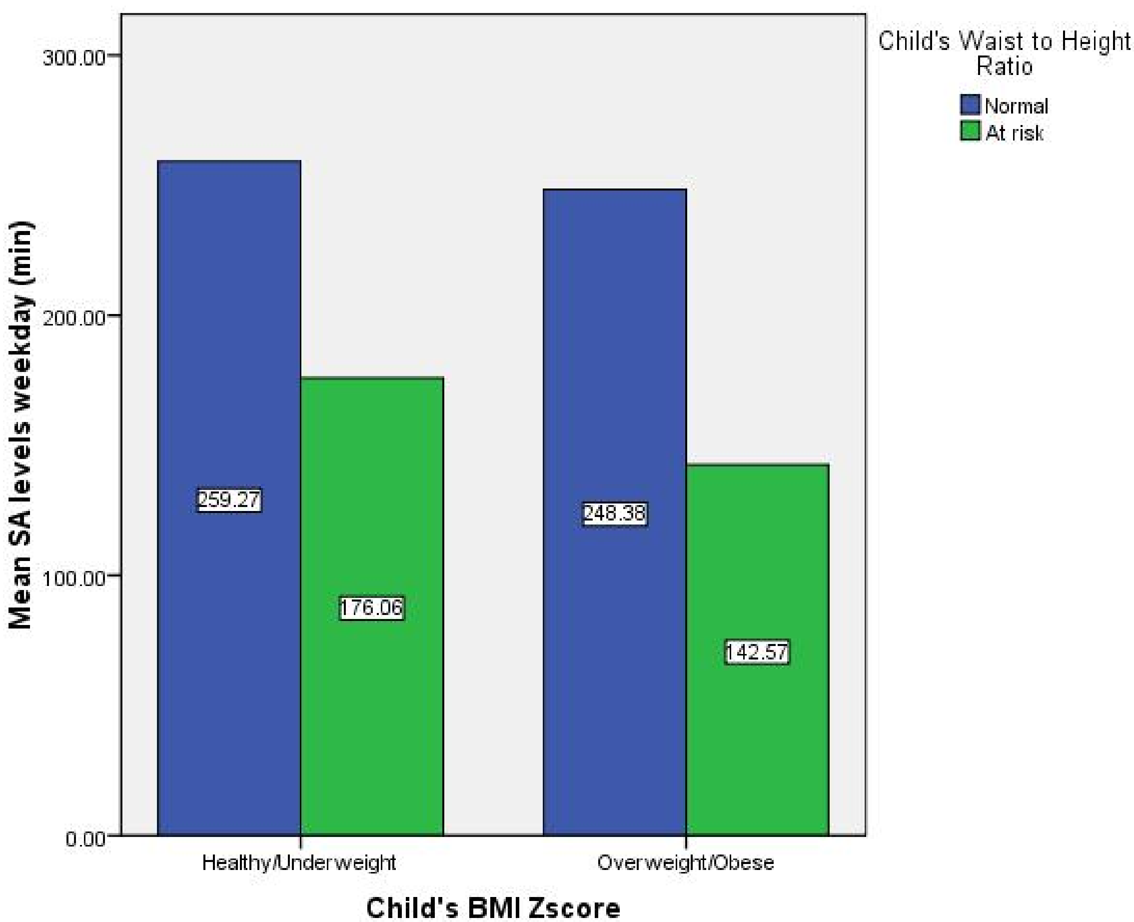
PA Levels Item			Mean (SD)	Test Score	p value
Moderate/ Vigorous activity on weekdays (min/day)	Vs SES area (ANOVA) (N = 210)	Low SES (n = 70, 33.3%)	139.21 (92.28)	1.186	0.307
		Lower Middle SES (n = 70, 33.3%)	164.13 (100.36)		
		Higher Middle SES (n = 70, 33.3%)	140.4 (102.97)		
	Vs Income (ANOVA) (N = 210)	Low Income (n = 86, 41.1%)	132.47 (120.00)	2.176	0.116
		Middle Income (n = 89, 42.5%)	153.27 (99.49)		
		High Income (n = 35, 16.7%)	171.34 (84.78)		
Moderate/ Vigorous PA on weekends (min/day)	Vs SES area (ANOVA) (N = 210)	Low SES (n = 70, 33.3%)	167.86 (96.23)	1.186	0.307
		Lower Middle SES (n = 70, 33.3%)	185.76 (116.22)		
		Higher Middle SES (n = 70, 33.3%)	157.01 (119.42)		
	Vs Income (ANOVA) (N = 210)	Low Income (n = 86, 41.1%)	149.72 (106.63)	3.503*	0.032
		Middle Income (n = 89, 42.5%)	175.25 (115.94)		
		High Income (n = 35, 16.7%)	206.70 (101.17)		
.			Median	.	.
Sedentary Activity on a weekday (min/day)	Vs SES area (Kruksall –Wallis) (N = 210)	Low SES (n = 70, 33.3%)	120	7.548*	0.023
		Lower Middle SES (n = 70, 33.3%)	235		
		Higher Middle SES (n = 70, 33.3%)	150.5		
	Vs Income (Kruksall –Wallis) (N = 210)	Low Income (n = 86, 41.1%)	130	6.941*	0.031
		Middle Income (n = 89, 42.5%)	205		
		High Income (n = 35, 16.7%)	240		
Sedentary Activity on a weekend (min/day)	Vs SES area (Kruksall –Wallis) (N = 210)	Low SES (n = 70, 33.3%)	187.5	9.346**	0.009
		Lower Middle SES (n = 70, 33.3%)	275		
		Higher Middle SES (n = 70, 33.3%)	191		
	Vs Income (Kruksall –Wallis) (N = 210)	Low Income (n = 86, 41.1%)	195	5.943	0.051
		Middle Income (n = 89, 42.5%)	210		
		High Income (n = 35, 16.7%)	300		

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.26 shows a significant difference between income groups in moderate/vigorous PA on weekends ($F = 3.503$, $p = 0.032$), post-hoc Tukey and Bonferroni revealing the high income group mean (206.70, SD = 101.17) to be significantly higher than the low income group mean (149.72, SD = 106.63). SA levels (which did not exhibit normal distributions), were subjected to non-parametric tests. Kruksall–Wallis tests revealed significant differences among SES areas in weekday SA ($\chi^2 = 7.548$, $p = 0.023$) and weekend SA ($\chi^2 = 9.346$, $p = 0.009$) levels. In both cases, the lower middle SES area had the highest SA levels while the low SES area had the lowest SA levels. Kruksall-Wallis also revealed a significant difference in weekday SA levels between income groups ($\chi^2 = 6.941$, $p = 0.031$), whereby SA group increased with increasing income group.

A Mann-Whitney test was run to see whether PA/SA levels differed significantly by gender. Results revealed that weekday PA ($z = -2.049$, $p = 0.040$) and weekend PA ($z = -2.496$, $p = 0.013$) differed significantly between genders, where boys outperformed girls. Only weekend SA differed significantly ($z = -2.205$, $p = 0.027$) between both genders, boys also spending more time in SA than girls.

Figure 4.11. Weekday sedentary activity mean (min) Vs BMI Z-score and WtHR



As Fig. 4.11 shows, sedentary activity on weekday was reported in similar amounts by BMI Z-score categories and differed with respect to WtHR categories, where a higher mean was reported in healthy/underweight children.

Table 4.27. Correlations of PA/SA levels and Child BMI Z-score/WtHR

Childhood Weight		Correlation score	p value
BMI Z-score	Moderate/Vigorous Activity on Weekdays (Pearson's r)	0.190**	0.006
	Moderate/Vigorous Activity on Weekends (Pearson's r)	0.236**	0.001
	Sedentary Activity on Weekdays (Spearman's ρ)	-0.138*	0.048
	Sedentary Activity on Weekends (Spearman's ρ)	-0.088	0.204
WtHR	Moderate/Vigorous Activity on Weekdays (Pearson's r)	-0.048	0.495
	Moderate/Vigorous Activity on Weekends (Pearson's r)	0.042	0.552
	Sedentary Activity on Weekdays (Spearman's ρ)	-0.396**	<0.001
	Sedentary Activity on Weekends (Spearman's ρ)	-0.436**	<0.001

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Correlation analyses (Table 4.27) found that increasing BMI Z-score was linked to increasing amounts of weekend moderate/vigorous PA on weekdays (Pearson's $r = 0.190$, $p = 0.006$), PA on weekends (Pearson's $r = 0.236$, $p = 0.001$) and weekday SA (Spearman's rho = -0.138, $p = 0.048$). Correlation analyses also revealed significant negative relationships between WtHR and weekday SA (Spearman's rho = -0.396, $p < 0.001$) and weekend SA ($r = -0.436$, $p < 0.001$)

4.8.9 Multivariate analysis of home environment variables on child weight status

Table 4.28. Multiple linear regression analysis adjusting for age and gender

	BMI Z-score			WtHR		
	B	**SE B**	**B**	**B**	**SE B**	**β**
Age 2-5	Reference category			Reference category		
Age 6-8	0.597	0.322	0.141	-0.029	0.015	-0.149*
Age 9-12	0.224	0.287	0.062	-0.043	0.014	-0.257**
Male	Reference category			Reference category		
Female	-0.085	0.232	-0.025	0.020	0.010	0.129*
Low Healthy Food Accessibility Score	.	.	.	Reference Category		
High Healthy Food Accessibility Score	.	.	.	.	.	-0.115
Low Unhealthy Food Accessibility Score	.	.	.	Reference category		
High Unhealthy Food Accessibility Score	.	.	.	0.045	0.013	-0.268**
Low Eating and Preparation Habits Score	.	.	.	Reference category		
High Eating and Preparation Habits Score	.	.	.	.	.	0.101
TV Meals	.	.	.	.	.	0.062
Parental PA Modelling	0.296	0.188	0.177*	.	.	.
Media Rewards Score	.	.	.	-0.009	0.004	-0.141*
Media Restrictions Score	.	.	.	.	.	-0.072
PA on weekdays	.	.	.	.	.	.
PA on weekends	0.003	0.001	0.166*	.	.	.
3 hours or less of weekday SA	Reference Category			Reference Category		
More than 3 hours of weekday SA	-0.667	0.253	-0.196**	.	.	-0.084
3 hours or less of weekend SA	.	.	.	Reference Category		
More than 3 hours of weekend SA	.	.	.	.	.	-0.133
R^2	0.119			0.240		
F for R^2	4.522**			14.093**		

*Significant at the 0.05 level (2-tailed) **Significant at the 0.01 level (2-tailed)

Table 4.28 presents the results of the multiple linear regression analyses. These analyses were run on factors which were significantly correlated to either BMI Z-score or WtHR to adjust for age and gender. Multiple linear regression on BMI Z-score showed that the model was highly significant, explaining 2.7% of total variance where F (209) = 4.522 (p< 0.01). Age and gender was rendered non-significant, however parental PA modelling and PA on weekends were significant (p<0.05) while weekday SA was highly significant (p< 0.01). With respect to WtHR, age and gender were both significant factors, with the 9-12 age category being highly significant (p<0.01). The only factors which remained (highly) significantly correlated to WtHR after adjusting for age and gender were unhealthy food accessibility (p<0.01) and media rewards scores (p<0.05).

4.9 Summary of Quantitative Findings

The quantitative study examined the first two questions of this study. This section responds to both questions, comparing the findings to existing findings in developed countries and trying to uncover underlying themes.

Data revealed that according to WHO cut-offs, 52.6% of reference children in this study displayed overweight or obese BMI Z-scores, while 49.3% displayed overweight/obese WtHRs. Although data on Egyptian children's overweight is scarce, this study's results are high compared to the 2008 EDHS data where 20.7% of girls aged 10-11 and 21.5% of boys aged 10-11 had at-risk or overweight BMIs. These figures are also high compared to the UK HSE's 2012 data showing that 28% of children aged 2-15 are classified as overweight or obese (NOO, 2015). Table 4.29 summarises the relationships between predictor variables and BMI Z-score/WtHR.

Table 4.29. Summary of statistically significant relationships of predictor variables with BMI Z-score and WtHR

Variable	BMI Z-score		WtHR	
	Sig. in univariate	Sig. in multivariate	Sig. in univariate	Sig. in multivariate
Age	.	.	-ve	-ve
Being male	.	.	-ve	-ve
SES areas	.	.	.	.
Income	.	n/a	.	n/a
Healthy food availability	.	n/a	.	n/a
Unhealthy food availability	.	n/a	.	n/a
Healthy food accessibility	.	n/a	-ve	.
Unhealthy food accessibility	.	n/a	-ve	-ve
Parental food modelling	.	n/a	.	n/a
Parental food policies	.	n/a	.	n/a
Eating habits and preparation	.	n/a	+ve	.
TV meals	.	n/a	+ve	.
Caregiver BMI	.	n/a	.	n/a
Caregiver WtHR	.	n/a	.	n/a
Smoking	.	n/a	.	n/a
Sleep on weekdays	.	n/a	.	n/a
Sleep on weekends	.	n/a	.	n/a
Outdoor area characteristics	.	n/a	.	n/a
Media availability at home	.	n/a	.	n/a.
Parental PA modelling	+ve	+ve	.	n/a
Active play allowance	.	n/a	.	n/a

Media restrictions	.	n/a	-ve	.
Media rewards	.	n/a	-ve	-ve
Moderate/vigorous activity on weekdays	+ve	.	.	n/a
Moderate/vigorous activity on weekends	+ve	+ve	.	n/a
Sedentary activity on a weekday	-ve	-ve	-ve	.
Sedentary activity on a weekend	.	n/a	-ve	.

4.9.1 Relationships between home environment variables and childhood weight

With respect to the food physical environment, the variable which showed significant negative relationships with childhood weight was the accessibility to healthy foods and unhealthy foods (with child WtHR). Both were found to be significant after running correlation analyses, but only unhealthy food accessibility remained significant after adjusting for age and gender through multiple linear regression analyses. The resultant non-significant relationship between accessibility to healthy foods and WtHR was not in line with studies in developed countries where greater accessibility to healthy food items showed higher levels of healthy weight in children (Ledoux, Hingle, & Baranowski, 2011; Saelens, et al., 2012; Boles, Scharf, Filigno, Saelens, & Stark, 2013). However, it was surprising to find that greater accessibility to unhealthy food items was correlated to lower WtHR in children. This finding seems to indicate that accessibility to unhealthy food items does not necessarily mean the child eats them. This also seems to hint towards parental control (feeding children who may/may not have access unhealthy food) as a potential hindrance to good health.

Of the four categories within the food social environment, none of the scores were significantly correlated with childhood weight after adjusting for age, gender and SES area. This finding is unexpected, given the existing positive associations between cohesive family dinners and healthier eating habits (Gillman, et al., 2000; Franko, et al., 2008; Kalavana, Lazarou, & Christodoulou, 2011) and inverse associations between cohesive dinners and overweight/BMI in childhood & adolescence (Taveras, et al., 2005; Gable, Chang, & Krull, 2007; Hammons & Fiese, 2011; Larson, Wall, Story, & Neumark-Sztainer, 2013). This is also surprising given the positive associations between food restrictions/pressure and BMI (Faith, et al., 2004; Webber, Hill, Cooke, Carnell, & Wardle, 2010).

Analyses revealed that moderate/vigorous PA on weekdays and weekends were significant positive predictors of BMI Z-score, and only PA on weekends remained significant after adjusting for age and gender. Weekday SA levels were negatively correlated with BMI Z-score, and only the relationship between weekend SA and WtHR (although significant in univariate analysis) was rendered non-significant after adjusting for age and gender. This is contrary to findings that decreased PA and increased SA lead to higher levels of overweight/obesity (Guillaume, Lapidus, Bjorntorp, & Lambert, 1997; Kohl III & Hobbs, 1998; Vandewater, Shim, & Caplovitz, 2004; Must & Tybor, 2005; Ortega, et al., 2007; Pahkala, et al., 2013). These findings concerning both PA and SA suggest that perhaps dietary, rather than PA influences, are more significant in determining childhood weight in an Egyptian context. This was the reason why children's PA levels and dietary factors were examined further in Phase III. Moreover, compared to UK data which recently reported data from England where 28% of 7038 children aged 2-15 met the minimum requirements of 60 minutes a day of moderate/vigorous activity (British Heart Foundation , 2012), this study's sample shows that urban Egyptian children may be more active: 80.8% and 81.3% of the sample met the minimum requirements on weekdays and weekends respectively.

Examination of the PA physical environment revealed that neither the outdoor area characteristics scores nor the media availability scores were significantly related to childhood weight. Studies in developed countries have shown that better outdoor area characteristics which promote outdoor play lead to greater PA and lower obesity rates (Burdette & Whitaker, 2005; Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008; Dunton, Kaplan, Wolch, Jerret, & Reynolds, 2009; de Vet, de Ridder, & de Wit, 2011; Evans, Jones-Rounds, & Vermeylend, 2012). Although statistically significant differences in both scores were seen between SES areas and incomes, these differences did not seem to be significantly related to children's weight. This finding may hint at cultural differences in childhood play and PA patterns, which are later investigated in Phase III.

Significant associations between the PA social environment and childhood weight categories were found between parental PA modelling scores with respect to BMI Z-scores (positive) which remained significant after multivariate analysis. Univariate correlation analyses revealed a significant negative association between media restrictions/rewards and WtHRs (both negative) where greater moderation decreased child WtHR, however only media rewards remained significantly correlated with WtHR after multivariate analysis. The positive correlation between modelling and BMI Z-score was expected, as studies on parental modelling revealed mixed findings with regards to associations with child PA (Moore, et al., 1991; Kohl III & Hobbs, 1998; Welk, Wood, & Morss, 2003; Gustafson & Rhodes, 2006; Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008; Crawford, et al., 2010; Holm, Wyatt, Murphy, Hill, & Odgen, 2012). This suggests a need to understand parental perceptions and engagement in PA, which is further investigated in the Phase III (Chapter 5), as these findings hint that parental perceptions of PA and their interactions with children may perhaps be different in Egypt. The negative correlation between media rewards and WtHR is an expected finding; partial restriction was scored as the intermediate/authoritative/better scores and had a healthy outcome on children's WtHR in accordance with previous studies (Berge, Wall, Loth, & Neumark-Sztainer, 2010; Franklin, 2012). However, the numbers of households that owned computers and videogames were less than households that owned television sets (all households), and thus households with TV's only could have potentially scored lower than those that had all three media items at home. This means that cumulative media rewards and restriction scores data may be skewed in favour of households that own greater media items, although the number of households that owned all three were very low. Moreover, the scoring procedure gave households that sometimes rewarded/restricted children with media items (authoritative) a 1, while those that always/mostly or rarely/never rewarded or restricted (authoritarian or permissive) were given a zero. Thus the distinction between both authoritarian and permissive was not evident in the results, but the difference between both and authoritative parenting was evident.

No significant correlations were found between parental BMI, WtHR, sleep and smoking scores with respect to childhood weight. Given the existing study findings on correlations between parental and child weight in developed and developing countries (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997; Strauss & Knight, 1999; Foresight, 2007; NICE, 2006; Davis, McGonagle, Schonei, & Stafford, 2008; Whitaker, Jarvis, Beeken, Boniface, & Wardle, 2010; Aljunaibi, Abdulle, Sabri, Hag-Ali, & Nagelkerke, 2013) between smoking and obesity (Chiolero, Faeh, Paccaud, & Cornuz, 2008; Kwon, et al., 2010; Patel, et al., 2011)., and between sleep duration and obesity (Chen, Beydoun, & Wang, 2008; Must & Parisi, 2009; Bell & Zimmerman, 2010; Börnhorst, et al., 2012), these findings were surprising.

4.9.2 Difference between home environments in SES areas and income groups

Univariate and multivariate analyses found no significant associations between SES variables (SES area and income) and child BMI Z-score and WtHR. This was an unexpected finding given the documented negative association between area level and obesity in both developed countries (McLaren & Gauvin, 2002; Morland, Wing, Roux, & al., 2002; Baker, Schootman, Barnidge, & Kelly, 2006; Giles-Corti, 2006) and between SES correlates and adult and childhood obesity in developing countries like Egypt (Monteiro, Moura, Conde, & Popkin, 2004; Hawkes, 2006; Goyal, et al., 2010; Mowafi, et al., 2011). Given this finding and the prevalence of obesity in both caregivers and children, this may indicate that both SES areas may be prone to obesity (perhaps by different channels). This is further investigated in Phase III. Despite showing no association with child BMI Z-score and WtHR, the quantitative study revealed that a large number of variables differed statistically with respect to socio-economic variables investigated.

In terms of the food physical environment, healthy and unhealthy food amounts were significantly higher in higher middle SES areas and high income areas. This is logical, given higher income and SES households can afford having greater amounts of food at home. However, the only significant difference in accessibility scores was between SES areas and unhealthy food accessibility. The higher middle SES area had the lowest accessibility to unhealthy food, while the lower middle SES area had the highest accessibility. This finding, coupled with the finding that higher unhealthy food access was correlated to lower WtHR in children, indicates that availability and accessibility may not be as important in Egyptian culture as other factors such as parental awareness and cultural issues. These issues were further examined in Phase III.

In terms of the food social environment, significant differences were found among SES areas in all four sub-categories. In terms of parental food modelling, scores were healthiest in low SES and low income households. This might be due to the fact that the cheapest food in Egypt is locally grown fruit and legumes which are quite traditional (Galal, 2002; Hassan-Wassef, 2004) and are thus affordable by the lowest SES and income groups. The parental food policies score was also significantly healthier in low SES areas, which might be due to their inability to afford or restrict/reward unhealthy food. This finding was verified by the unhealthy food availability results. Eating habits and preparation scores were highest in higher middle SES area households, indicating greater family cohesion and food at home in those households. TV meals' findings revealed that in both ends of the SES area spectrum examined, TV meals were practiced often by children. In low SES area households this may be due to the poor outdoor area characteristics and also the low family cohesion. In higher middle SES areas, this may be due to the increased media availability at home.

Caregiver weight status was only significantly different between SES areas. The highest caregiver mean BMI was found in lower middle SES households and the lowest was found in both low SES and higher middle SES households. Despite the fact that most caregivers were overweight/obese in this study, lower BMI in low SES households may be due to their roles as housewives or their work which involve manual labour, noted in studies on developing countries (Bauman, et al., 2012; Macniven, Bauman, & Abouzeid, 2012). Smoking was least practiced in both low SES and higher middle SES households. This might be due to affordability issues in low SES households, and awareness of the dangers of smoking and adoption of modern attitudes to smoking in higher middle SES areas. Children's sleep levels on weekdays and weekends were significantly higher in low SES households, which may be due to the less encouraging outdoor environment.

Children’s moderate/vigorous PA levels on weekends were significantly higher in higher income households. This might be due to the better outdoor environments in high SES areas and high income families (also reported in the results). It might also be due to higher income children having higher chances and opportunities to practice PA. However, SA levels on weekdays and weekends were also significantly higher in high SES children. Since two of the three sedentary activities investigated involved the use of media, this is expected given the higher availability of media items reported in high SES households.

With respect to the PA physical environment, both outdoor area characteristics and media availability scores were significantly higher in higher SES areas and higher income households. The difference in outdoor area characteristics scores was similar to findings in developed countries, where more affluent areas have more encouraging outdoor environments and lead to higher PA and less obesity (Ellaway, Macintyre, & Bonnefoy, 2005; Mawle, 2006; Evans, Jones-Rounds, & Vermeylend, 2012). Media items were more likely to be found in greater numbers in more affluent households that could afford to own them.

As expected, parental PA modelling scores were significantly the healthiest in higher middle SES and higher income households. This might be due to caregivers in higher SES households having a better perception/awareness of the impact of PA and physical exercise. This is investigated further in Phase III. Active play allowance scores were significantly healthier in lower middle SES areas. Media restriction and rewards were significantly healthier in lower middle SES households.

Sleep duration on weekdays was also found to differ significantly between SES areas, where low SES households children had higher sleep duration mean than middle SES children. This might probably be explained by the lack of media availability at home.

Overall, SES areas were revealed to have a greater significant impact on the home environment than incomes. This may indicate that in Egypt, income alone is not entirely representative of socio-economic status. Moreover, the great physical and social differences between Egyptian SES areas, noted here and in previous studies (Sims, Sejoume, & El

Shorbagi, 2003; Denis, 2006), indicate that SES area may be a better representative indicator of socio-economic status.

4.9.3 Conclusion

When looking at the significant relationships between the home environment and childhood weight in urban Egypt, it was found that within the food physical environment, accessibility to unhealthy foods was associated with lower child WtHRs. Looking at the PA environment, the only significant aspects relating to children's weight were media rewards, where authoritative (moderate) parenting yielded the healthiest WtHR scores, and to a less extent parental modelling where, inversely, parents with higher modelling scores were more likely parents of children with overweight/obese BMI Z-scores. PA and SA levels were found to be highly significant after correlation analysis/regression, where higher weekday SA was associated with lower BMI Z-scores and higher weekend PA was associated with higher BMI Z-scores. Socio-economic differences between home environments revealed that higher SES/income households had greater amounts of healthy and unhealthy food at home. Higher SES households also scored higher in Eating and Preparation Habits (eating at home and family cohesion), but lower on parental modelling. Additionally, the higher the SES/income category, the higher the outdoor area characteristics (more desirable) and media ownership at home (more media items). Middle SES households scored healthier on parental PA modelling and on active play allowance, and media restriction and rewards. Low SES area children slept more than middle SES area counterparts. The next chapter examines the study's qualitative phase and attempts to answer the latter two questions of this study.

Chapter 5 Phase III: Qualitative Study

5.1 Chapter Overview

This chapter presents Phase III, the qualitative study. The chapter begins with a description of the questions that this qualitative phase is addressing. This is then followed by a critical discussion of the qualitative study's methodology, including the choice of questions for the semi-structured interviews and their application in a school setting. The chapter also critically discusses and describes the methods of analysis (translation, transcription and subsequent thematic analysis). The chapter then presents a demographic description of the sample, including ages, job types, salaries, SES areas the respondents lived in, as well as BMI measurements calculated from the interviewees' weight and height measurements. Following this is a detailed content analysis of the semi-structured interviews administered. The findings are broken down into the main areas of the interview grouped by the major themes investigated within the study. Finally, the chapter discusses underlying themes and issues that emerged from the interviews.

5.2 Questions answered by the Qualitative Study

The qualitative study section aimed at answering the second two questions this study examines:

3. **What are the maternal perceptions of obesity and physical activity in Egypt?**
4. **What are Egyptian children's diet and PA experiences and do these differ between SES areas?**

The follow-up study was conducted in October–November 2011 for the purposes of adding depth and insight into the results of the quantitative survey (n = 210), investigating parental perceptions of obesity, dietary habits and PA, as well as the dietary intake and PA of children of the three different SES household categories investigated in the initial study. Moreover, the follow up study aimed at examining perceptions of health and obesity. Perceptions of mothers about their own and their children's health and obesity were investigated to examine the cultural reasons behind obesity prevalence in Egypt, verified by the original study (the majority of primary caregivers were overweight/obese, 53.6% of reference children displayed overweight/obese BMI Z-scores and 49.3% displayed at risk WtHRs).

The follow up study comprised quantitative measurements which included weight, height, and were measured by calibrated stadiometers similar to the first phase. Also, a series of qualitative face-to-face semi-structured interviews were administered with a sample of mothers of children ages 2-12 (n = 17) who lived in Cairo. Mothers were chosen in accordance with the literature on Egypt, which states that the housewife is always the main caregiver in the household regardless of status and position (Aldinger & Bauernfiend, 2003), which was evident after the quantitative phase (in which mothers always were the main caregiver). Face-to-face interviews were chosen as a tool as they are spontaneous and allow for in-depth conversations, obtaining social cues from the interviewee (body language, intonation) as well as verbal responses, and allow for exploration and elaboration of themes (Mathers, Fox, & Hunn, 2002; Opednakker, 2006). However, a limitation of face-to-face interviews mentioned by Opdenakker (2006) may be that the interviewer may use the spontaneity in a face-to-face interview to (perhaps unintentionally) guide the interviewee in a certain direction. This was taken into consideration, and a set of guided questions were drafted to follow a set path while allowing for flexibility. Additionally, face-to-face interviews may be affected by social desirability effects, whereby respondents would be less likely to report behaviours/attitudes perceived to be undesirable than in other types of questionnaires (eg. online/mail) (Duffy, Smith, Terhanian, & Bremer, 2005; Taylor, Krane, & Thomas, 2005).

The following sections describe the data collection and analysis stages of the qualitative study. The generation of semi-structured interviews, the administration within the school setting, the transcription and content analysis processes are detailed, including the study boundaries and limitations to ensure issues of credibility, transferability, dependability and confirmability in accordance with guidelines of qualitative research (Fidel, 1993; Kulthau, 1999; Marshall & Rossman, 1999; Silverman, 2000; Shenton, 2004). These issues, and how they are resolved are addressed in section 5.3 - 5.10 in detail.

5.3 Semi-Structured Interviews

The methodology involved the use of semi-structured interviews. Semi-structured interviews were chosen as they have numerous advantages; they allow for detailed questions and responses and are beneficial for probing fully for answers on a certain topic, they remove any literacy requirements on the interviewee's part and it allows them to give their opinions on the issues discussed (Bowling, 2009; Harrell & Bradley, 2009). Semi-structured interviews have been used often with respect to perceptions of obesity in children, in teenagers or perception of parents regarding their children (Park, Im, & Im, 2003; Brown, Thompson, Tod, & Jones, 2006; Liou & Bauer, 2010; Southwell & Fox, 2010; Babooram, Mullan, & Sharpe, 2011). This was coupled with anthropometric measures, taken with light clothing by a female chaperone. Height and weight were measured using a calibrated stadiometer and calibrated scale respectively. The strengths and limitations of the anthropometric measures were mentioned in the critical discussion of the quantitative study (Section 4.6.2). The interviews were based on an interview schedule (See Appendix C) which was compiled and reviewed by academics to ensure credibility before departure to Egypt.

Section I: Anthropometric measurements and Personal Details

The first section comprised personal details. These details included age, monthly salary and area of residence. Also in the section were anthropometric measurements (weight in kg and height in m) which were taken at the physician's office at the school. BMI (in kg/m^2) was later derived from height and weight measurements.

Section II: Dietary Habits

The second section of the interview was guided/based on a table in the printed version of the interview, which investigated the types of food (vegetables, fruit, milk and dairy, grain, protein, oils and fats, sugar and salts) eaten by the household during breakfast, lunch, dinner and snacks. Food groups were adapted in part from the food groups mentioned in the Healthy Eating Index 2005 (USDA, 2008). Moreover, the table was also designed for face validity by adding foods common to the Egyptian diet, from personal knowledge and from research (Hassan-Wassef, 2004) and from interaction with El Zanaty & Associates, the research agency that helped in the initial study.

Section III: Perceptions of Obesity & Physical Activity: Interview

The third section examined the interviewee's perceptions of their and their children's weight (they were asked about how they perceive themselves and their child as having a healthy weight/being obese), as well as the general state of obesity among women and children in Egypt. The interviewees were also asked to discuss their child's physical exercise and their views on PA and nutrition. Their potential concerns over health, their perception of their and their child's PA and their opinions on the amount of PA they and their children engaged in were also investigated. This section was compiled after a review and similar surveys regarding perceptions of obesity and physical exercise (Hardus, van Vuuren, Crawford, & Worsley, 2003; Hesketh, Waters, Green, Salmon, & Williams, 2005; Walling, 2008; Jancey, Clarke, Howat, Maycock, & Lee, 2009; Lindelof, Nielsen, & Pedersen, 2010). This qualitative questionnaire was also reviewed with researchers from El Zanaty & Associates, the research agency that offered help and guidance in the initial quantitative phase.

5.4 Selection and Sampling Technique

Sampling and interviews were carried out in November 2011. Ethical approval (HSCR 11/13- see Appendix E) was received in November 2011 from the Ethics Panel at the

University of Salford allowing for the interviews to be administered. Due to the political situation, insecurity and instability in Egypt following the January 25th 2011 revolution, the sampling method that was employed in the main study (interviewing people in their own homes) was not feasible. This was due to heightened insecurity during and following the revolution regarding research, coupled with caution of strangers due to the increase in robberies, lootings and attacks on people and apathy from local police forces.

It was decided to contact an educational institution to ensure feasibility of the study. For this reason, purposive sampling was used, as purposive sampling allows for the researcher to choose his/her sample on a variety of criteria (Jupp, 2006). The main criterion considered in this phase at this particularly turbulent time was the willingness of Egyptian citizens to participate in an interview, and also for the safety of the researcher. Purposive sampling is a commonly used tool in qualitative research (Tashakkori & Teddlie, 2003). The mixed method nature of the research counters the main disadvantage of purposive sampling; the subjectivity involved. The main limitation of this phase was that children of respondents were not included (some may not be at the school in question, and access to them was difficult). As part of investigating perceptions, it was initially desired to include children's anthropometric measurements and a comparison of their actual weight status compared to their mothers' perceptions. This would be difficult, as not all the staff (particularly those from low SES areas) could afford to enrol their children in the school. The description of the child's weight status was thus dependent only on the mother's perceptions rather than being directly measured by the researcher, and studies have shown that parents rarely perceive their own children's obesity accurately (Myers & Vargas, 2000; He, 2007; Towns & D'Auria, 2009; Taylor, 2012).

In order to ensure a sample similar to the quantitative study, an international school was chosen, as it would be the strongest and safest option to access staff/mothers from middle and low SES areas. The Nefertari International Schools were contacted in early October 2011. Nefertari International Schools has 2280 staff & workers (teachers, janitors, administration officials) who hail from all levels of the Egyptian social strata. The school chairperson was contacted personally and told of the aims and objectives of the study. Written permission was obtained from the chairperson permitting the study to be conducted on the school premises. The Nefertari International Schools aided the study further by providing an interview room, commonly used for job interviews, for the research. Also provided was the school's female physician, who helped in anthropometric measures through the use of a calibrated stadiometer and calibrated scale located in the school clinic.

Another limitation of the sampling was that it did not mirror the sampling from the quantitative survey. In this regard, 90% of the initial quantitative sample (n = 188) consisted of housewives, as the researcher carried out the quantitative sampling during the daytime, whereas the qualitative phase of the study examined working mothers, who had only comprised 10% (n = 22) of the quantitative sample. Therefore, data extracted from this sample may not be applicable to the initial quantitative sample. Despite the number of setbacks, this method was the only safe method of obtaining data from parents at such a difficult and politically turbulent time in Egypt.

The school was visited prior to the interview stage, to familiarize the researcher with the culture, developing trust from the employees' side to ensure credibility in accordance with research (Silverman, 2000; Shenton, 2004). As well as meeting the employees, they were informed verbally by means of posting flyers asking for participation. The head of the cleaning staff was also asked to relay information in the event that any of them were illiterate. Participants who were willing to participate were asked to report to the interview room at any time of the days the researcher was at the school. Those willing to participate were asked one filter question, whether or not they had a child between the ages of 2 to 12. When recruited, participants were given the participant information sheet at the start of the questionnaire (see Appendix C) and asked to read and sign. The respondents were first asked whether they were literate. The information sheet was read to those respondents who could not read, and they were asked to sign if they consented to participation. If they decided not to participate at any time of the study, their information and data would be removed from the study. None of the respondents decided not to participate at any given time during this phase.

5.5 Anthropometric Measures

Anthropometric measures were also taken in the second qualitative phase of the study. Consenting participants were first asked to have their anthropometric measurements taken before the interviews were conducted. Each respondent's anthropometric data was measured, namely weight (kgs) and height (m). Collection of this data was done at the school's clinic by the school's female physician, in accordance with cultural norms. Height and weight were measured using a calibrated, portable standing stadiometer, and weight was measured with calibrated portable weighing scales, both available at the school's clinic. Measurements were taken over thin clothing and no removal of clothing was necessary. Personal details (area of residence and age) were also asked and written down.

5.6 Interview Procedure

The semi-structured interviews took place in a quiet room on the ground floor, the school's interview office. At the interview, only the main researcher and the interviewee were present and the office. The office door was closed, but sometimes there were a few interruptions by other teachers/administrative staff to talk to the interviewee about a matter. One of these interruptions resulted in a dialogue about the question that was being asked at the time, concerning whether parents were more worried about sons or daughters being obese.

The interviews were taped using a small portable electronic audio recording device, and each audio file was tagged with the corresponding respondent on both audio and paper. Using tape recorders is beneficial in that the exact wording of the respondent is recorded (thus avoiding mistakes that occur while note-taking) and also the way in which the words were said (the intonation, pauses) which is important (Bryman, 2001; Opednakker, 2006). Moreover, since this study involved transcription into a different language, recorded interviews were needed to generate as accurate a transcript as possible. However, tape recording does have its drawbacks, such as machine malfunctioning/errors, time consuming analysis involving listening and re-listening to interviews, as well as respondents being careful with responses (due to awareness of being taped) (Bryman, 2001; Opednakker, 2006). Prior to recording, participants were asked whether or not they agreed for the interview to be taped on a Dictaphone. All participants in this study agreed, and the interviews were recorded as planned.

Interaction with the respondents was easy and respondents were quite cooperative. Since the school is an international mixed school where gender interaction is allowed, the situation was more relaxed then if the main respondent (a male) was to interview female respondents in a more sensitive location (at home for instance). However, it would have been more open had the main researcher been female. Egyptian culture places a great emphasis on academic achievement, and knowing that the interviewer was an Egyptian PhD student made participants more willing to participate and cooperate in the interviews – although they may have not been as interested in the topic discussed.

In order to ensure credibility, the researcher informed participants that (a) they had a choice to refuse answering any questions and (b) the researcher was independent and that their responses (particularly regarding school PE programmes quality – if their child was in the same school) will remain confidential. Moreover, informants were asked to elaborate their responses to gain better insight on the topic at hand. It was noticed throughout the interviews that the cleaners (the low SES area respondents) responded with short responses, while administrators and teachers (residents of the middle SES areas) had more detailed responses. This was particularly evident when asked about their opinions. This might be due to low SES area respondents' views of themselves as having had lesser education opportunities - some were illiterate. Perhaps they might have also been shy in discussing health matters with a health professional lest they come across as unaware of the topic discussed. When using the terms 'overweight' and 'obese', the Arabic equivalents '*tekheen*' (fat or overweight) and '*semeen'* (obese) were used. In classical Arabic, the difference between the two words is clear, however in colloquial Egyptian Arabic, these two terms are used interchangeably – there is not a perceived difference between the two words in everyday usage. Before the start of the interview, respondents were made clear of the difference between the two words and how they will be used in the interview.

5.7 Transcription

The interviews were transcribed directly from audio (in Egyptian Arabic) into English text (see Appendix G). Usually this presents a problem when the main researcher is not a speaker of the language in which the interviews are conducted (Moerman, 1996). However, in this study's case, the main researcher (whose native tongue is Egyptian Arabic) conducted the interviews, thus the conversations with the respondents were understood fully and translated by the main researcher into English as well. Moreover, the interviews were transcribed (in English) as a means of presenting a socio-cultural representation of perceptions of obesity, and render it available in a widely spoken language. It is recognised that transcription in a different language to the one employed in the interviews presents difficulties in conveying the culture examined, and may also affect the interview's power in the process (Moerman, 1996; Bucholtz, 2000). The main researcher thus translated the transcriptions as closely as possible to the original Arabic interviews, keeping in mind the cultural context (which as a native, he is aware of). Buscholtz (2000) and Oliver, Serovich and Mason (2005) identify two types of transcription; naturalised (which retains elements of oral speech, thus being the truest form of interpretation) and denaturalised (whereby the transcribed text adheres to written rules and codes). The transcription conducted in this study was naturalised, keeping in all the pauses in speech, 'um's and 'er's, despite being aware that (a) naturalised transcription is more appropriate when dealing with sensitive issues such as identity or disease (Oliver, Serovich, & Mason, 2005; Bucholtz, 2000) and (b) content analysis, the analysis method employed in this study, examines content and language employed (Davidson, 2009). However, since this study is a pilot examining maternal perceptions of obesity in Egypt, it was appropriate to retain as much of the natural transcription as possible for future/further research. Furthermore, given that this was a pilot study, the author felt the need to retain as much of the natural speech as possible even though content analysis was used in this study.

5.8 Content Analysis

Analysis of the semi-structured interviews was carried out through content analysis. By definition, content analysis is a tool to extract information from a body (text or verbal) through the identification of characteristics within that body (Smith, 2000). Therefore, it is quite often and conveniently employed in data such as surveys and interviews (Kondracki, Wellman, & Amundson, 2002) and has been used often in public health studies (Nandy & Sarvela, 1997; Elo & Kyngäs, 2007). This made content analysis ideal for the analysis of this study's semi-structured interviews. One of the main uses of content analysis in social science is to describe and compare cultures (Smith, 2000). This study phase aimed to, among other things, describe the Egyptian cultural context (perceptions of obesity, food patterns and food types etc.) and content analysis is suitable for this task. Although content analysis is tricky in that it is not very formulaic or structured (Polit & Beck, 2004), it served this study well as this study is a pilot study aiming to cover new ground in research.

When employing content analysis, a researcher must decide the intent and the technology employed (Kondracki, Wellman, & Amundson, 2002). With regards to intent, namely the purpose and desired outcome, an inductive method was used whereby analysis of the text starts without notions or categories, and consequently noting key words and themes that can be the basis for later analysis (Kondracki, Wellman, & Amundson, 2002). The type of content analysis thus employed was the conventional content analysis, often used when literature on a particular topic is quite limited (like this study) and involving the avoidance of pre-conceived categories with the aim of allowing categories to emerge from the data (Hsieh & Shannon, 2005). Although the analysis process was inductive, aiming for concepts and themes to emerge from the interviews on a topic previously un-researched in this study's context, the interviews themselves were based on the investigation of an existing topic (perceptions) – albeit one with little literature with regards to Egypt. This is not a limitation to the study, as inductive and deductive methodologies are often used together (Kondracki, Wellman, & Amundson, 2002; Schadewitz & Jachna, 2007). Therefore, this study, while relying on induction, also had large deductive elements. In this study's case, a coding framework was not established prior to analysis, but the interviews themselves were informed by the models and pre-existing themes on which the larger study is based. Many of the questions asked, for example *'If your child is a boy, would you be more concerned about overweight/obesity if your child was a girl? And if your child is a girl, would you be more concerned about overweight/obesity if your child was a boy?'* or '*Do you think your child's school is doing enough to reduce rates of childhood obesity? And do you think schools should play a bigger role?'* may seem deductive and may seem to have preconceived codes – in both these cases a 'Yes' or 'No' response. However, these questions were followed up in the interviews with an elaboration, and the respondents were allowed to reveal and elaborate their own opinions and reasons supporting their claims. It is this support which allowed for this study's inductive analysis, as the aim was to examine the views of a culture previously not studied with regards to the thesis topic.

With regards to technology, the interview transcripts were analysed manually/traditionally. Although the data set may have benefited from analysis through software (Smith, 2000; Kondracki, Wellman, & Amundson, 2002) it was preferred to examine and re-examine the texts manually to delve deeper into the transcripts and further extract important themes. Computer analysis is often used for large samples, whereas in this study there were only 17 respondents. Moreover, theme extraction is ultimately done by the researcher and not the software, and it has been noted that the use of computational data is insufficient on its' own due to the systematic rigor and the contextual awareness of the researcher/traditional content analysis (Lewis, Zamith, & Hermida, 2013). Even though Lewis, Zamith and Hermida (2013) stress blending traditional and computational methods, they stress so for studies having large amounts of data, which this study does not. This involved the generation of large A3 tables, each table addressing a particular section of the interview. Each respondent was allotted a cell per question, and responses were copied into each square. Coloured markers were then used to highlight similar themes within these responses, after which tables were carefully examined to identify these similar themes. Also, numerous meetings were held with supervisors to discuss and analyse qualitative content, which allowed for scrutiny of the data as well as to ensure trustworthiness.

5.9 Saturation

The study aimed to interview fifteen respondents, five respondents from each SES area investigated, and this was achieved. This was in accordance with Bertaux's (1981) recommendation that all qualitative studies should contain a sample of at least 15 to be acceptable (Guest, Bunce, & Johnson, 2006). Moreover, Ritchie & Lewis (2003) specify several criteria to address the meeting of saturation requirements in a qualitative study, which include the heterogeneity and characteristics of the sample, and the resources available. Five respondents from each SES area had to be interviewed to ensure the inclusion of a sufficient amount of respondents to represent the same areas investigated in the quantitative study. Moreover, the resources available were limited, as sampling in the SES areas after the Egyptian revolution was unfeasible, and the interviews depended on the availability of the school employees and the time and resources the school could offer the researcher. However, Mason (2010) argues that the point of saturation is very difficult to pinpoint after trying to find the ideal sample number in qualitative studies by investigating 2533 qualitative research studies of various disciplines. In doing so, however, Mason found that 80% of these qualitative studies met Bertaux's requirements.

5.10 Data Protection

Data containing personal details was collected with the informed consent of the respondent, and all data was collected and kept in a safe environment (electronic or otherwise).

5.11 Anthropometric Data

Table 5.1. Qualitative sample description

Participant Code	Age	Job Type	SES Area	Salary bracket p/m (LE)	Weight status according to BMI (kg/m²)*
C1	40	Cleaner	Low	501-1000LE	Obese
C2	44	Cleaner	Low	501-1000LE	Obese
C3	30	Cleaner	Low	501-1000LE	Overweight
C4	49	Cleaner	Low	501-1000LE	Overweight
C5	28	Cleaner	Low	501-1000LE	Overweight
C6	36	Cleaner	Low	501-1000LE	Obese
C7	39	Cleaner	Low	501-1000LE	Overweight
A1	32	Administration	lower middle	1001-2000LE	Healthy weight
A2	33	Administration	higher middle	1001-2000LE	Overweight
A3	30	Administration	lower middle	1001-2000LE	Underweight
A4	36	Administration	lower middle	2001-3000LE	Overweight
T1	31	Teacher	lower middle	3001-4000LE	Healthy weight
T2	37	Teacher	higher middle	3001-4000LE	Healthy weight
T3	32	Teacher	higher middle	3001-4000LE	Overweight
T4	34	Teacher	lower middle	3001-4000LE	Overweight
T5	39	Teacher	higher middle	3001-4000LE	Healthy weight
T6	31	Teacher	higher middle	3001-4000LE	Healthy weight

***Underweight = below 18 kg/m², Healthy weight = 18 – 24.9 kg/m², Overweight = 25 – 29.9 kg/m², Obese = 30 kg/m²and above**

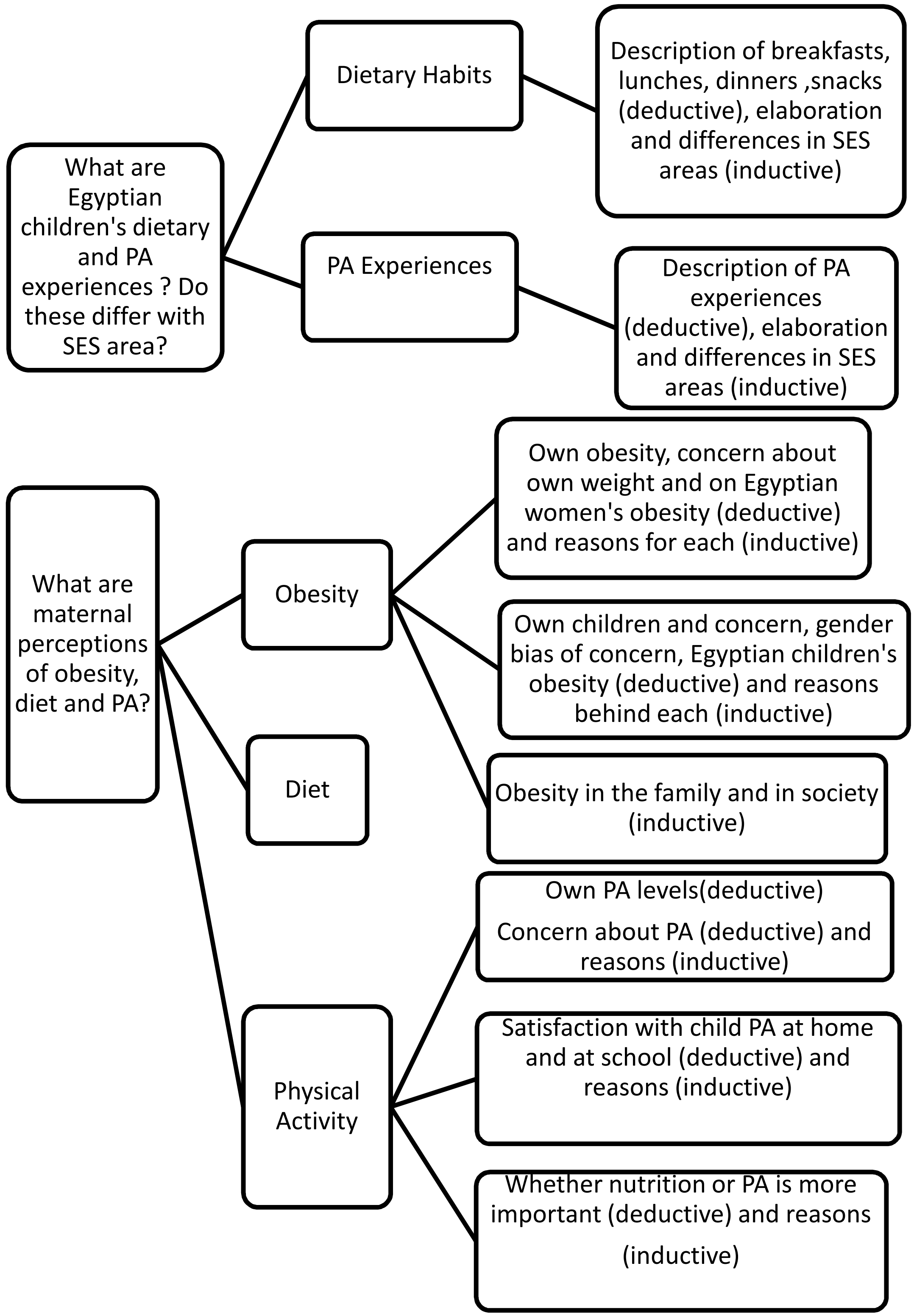
Table 5.1 reveals that seventeen female respondents participated in the semi-structured interviews. All were employees at the school, and the participants were teachers, administration members, and cleaners. When asked about their monthly salaries, it was evident that the lowest paid staff members were the cleaners, who earned between 501-1000 LE per month. All seven cleaning staff members who participated lived in areas classified as low SES areas. Administration staff members were paid between 1001-2000 LE per month or 2001-3000 LE depending on position, and most of them (with one exception) lived in lower middle SES areas. The highest paid category were the teachers, who earned 3001-4000 LE and lived mainly (with one exception) in higher middle SES areas. The majority of respondents were aged 30-39, a couple of cleaners were aged 40-49 and a young cleaner was aged 20-29.

BMI measurements were calculated and compared to the standard (NHS, 2008) adult weight guidelines (25 kg/m^2 and above = overweight, 30 kg/m^2 and above = obese). Anthropometric measurements showed that among the three SES areas interviewed, all of the low SES area respondents were overweight or obese (four were overweight and three were obese). The SES area with the greatest variation was the lower middle SES area, where one respondent was underweight, two had healthy weight and two were overweight. The higher middle SES respondents were not obese, although two of the five respondents were overweight. This small sample's anthropometric measurements, although too small for any analysis, hinted at a SES area difference in weight, whereby women's overweight and obesity are negatively correlated with SES area.

5.12 Study findings

The following sections (5.13- 5.19) highlight the results of inductive analyses on the transcribed interviews. Figure 5.1 (see the next page) is a flow chart describing the main findings for the whole interview. Later sections will begin with similar flow charts and tables detailing the responses and themes, followed by a detailed analysis of the section at hand. All flow charts in this chapter move from left to right, starting from the main topic investigated, later displaying the themes/responses and further elaborations to each question asked.

Figure 5.1. Process for the entire interview



5.13 Eating Patterns

Table 5.2. Egyptian children's dietary habits

Meal	Meal Components in Egyptian Households
Breakfasts	• All SES area participants ate bread (white, balady, buksumat, fino), cheese sandwiches, milk, tea, sugar • Low SES area participants: foul, ta'ameya • Middle SES area participants: Brown bread, eggs, chocolate spread, cake, sweets
Lunches	• All SES area participants ate meat (chicken, beef mainly), rice (alone or in dolma), vegetable dishes, salted pickles • Low SES area participants: cooked lunches with ghee, ate whatever is available, salted pickles (mekhalel) • Middle SES area participants: cooked lunches with corn oil/sunflower oil, chocolate, sweets, crisps
Dinners	• All SES area participants ate yogurt • Low SES area participants ate leftovers from lunch, whatever is available, feteer, halawa • Middle SES area participants: Cake, pizza
Snacks	• All SES area participants : chocolate, crisps • Lower middle SES area participants: fruit, fruit juice

Table 5.2 reveals the findings of Egyptian households' dietary habits. Whether food categories inquired about were available at home or not was analysed deductively, as they were based on the categories in the 2005 Healthy Eating Index (USDA, 2008). However, the inductive element in this section involved respondents' elaboration on the types of food within these categories that were consumed (an insight into Egyptian food habits), and differences in food consumption between different SES areas.

5.13.1 Breakfasts

Examination of the interview data revealed that for the whole sample, breakfasts were very important meals. Bread was consumed commonly by many of the families in question, either as traditional pitta bread (which is white), baladi bread (brown), long bread sticks (called buksumat), or in the form of long soft white sandwich bread (called 'fino' in Egypt).

> "The most important thing to my daughter is the glass of milk in the morning, with bread or buksumat. " – C1

> "We have [sandwiches] in fino bread." – A1

> "[…] and bread of course […] Brown […] they say it's more healthier"- T3

Although the sample consumed a variety of bread types, some healthier than others, the only household to report eating brown bread for health reasons was in the higher middle SES area. Bread was consumed often in sandwiches, which varied in content. Caregivers prepared cheese or cucumber sandwiches for their families. Cheese was a staple food among many households regardless of SES. Some caregivers from lower SES areas prepared or bought cheaper more filling options, such as the cheap local foul (fava beans) and ta'ameya (the Egyptian name for falafel) sandwiches.

> "Maybe a foul sandwich, feta sandwich and sometimes cheese (one sandwich) […] this is […] that's it."- A1

> "At breakfast, she could eat a sandwich with cheese […]" – A2

> "Whatever's available, we eat. Sometimes we go to the restaurant round the corner and get foul and ta'ameya sandwiches, light things like that. If they want cheese or milk, we get them, if we can afford, if it's within our budget. We are 6 people at home, my husband, my kids and me." - C4

Eggs were also a popular breakfast option among several households (mostly middle SES). Eggs were either prepared boiled or as omelettes.

> "Eggs! I always make sure that eggs are included [...]"- A3

> "What do we have? Usually eggs, omelettes or boiled eggs, either one."- T6

Some middle SES households provided more calorific options for breakfasts, including chocolate spread, and even cakes and sweets in one household.

> "Sometimes he takes chocolate spread, whatever."- T5

> "For breakfast, there usually is […] cakes or sweets"- T1

Most caregivers reported their children drinking milk, while they themselves drank tea (only three caregivers reported drinking coffee). Almost all of the interviewees reported having sugar with every cup of tea/coffee they drank. Most of them usually added two spoons of white sugar. Several children were also given tea in the mornings, and were given sugar with their tea. One caregiver, from a low SES area, reported her children and husband adding seven or eight spoons of sugar to their cups of tea.

> "It differs according to everyone's taste. For example, the kids, they drink [tea] like me, with two spoons of sugar. Their father's is different, he takes a high amount of sugar.The kids are like me though; they're more stable."- C3

> "Me, I do not take much [spoons of sugar in tea]. My husband takes more, 5, 6 or 7. […] They [the kids] take alot as well, 6 or 7. Sometimes they take less, like 3 or 4, and sometimes they take 7 or 8."- C6

Examining breakfast content among the sample showed similar patterns among all SES households, namely the popularity of bread in all its forms. However, the higher SES areas reported a greater variety of food options. Low SES area households seemed to eat what was available and affordable, and opted for cheap and satiating options, which are sometimes quite unhealthy (for instance, the high amount of sugar added to cups of tea). Middle SES respondents could afford to buy more food, but sometimes provided unhealthy options to their families (chocolate spread, cakes, sweets).

5.13.2 Lunches

Among the whole sample, lunch was the meal with the most options, indicating that lunch was considered the main meal among Egyptian households. Meat dishes were extremely popular at lunchtime; all but one caregiver reported having meat dishes as an option. Chicken was the most commonly prepared meat dish, followed by beef. Fish was only mentioned by three households as a meat dish option.

"Meat, beef or chicken. Usually it's chicken."- A3

"… or chicken panné."- T6

"If I want I bring chicken… a chicken and divide it up between the four of us"- C1

Rice was a staple dish across all households, and was prepared either alone or as dolma (stuffed peppers). Vegetable dishes were essential in all households examined. The majority prepared traditional Egyptian vegetable dishes, some prepared salad as an accompanying dish.

"[...] and if I prepared a vegetable dish, then I would prepare rice with it."- A4

"Another time I make regular cooking and rice and salad […]"- C1

"Rice or macaroni […] Vegetables, whatever. "- T3

Several caregivers from lower SES areas mentioned that they prepared whatever was available to cook at home.

> “ If not (eating chicken or meat) we prepare very local foods … like fried potatoes , aubergine, mesa’a, things like that […] sometimes koshary, depends on what’s there at home on the day”- C2

Most of the sample reported using various oils in cooking (corn oil was reported most, also sunflower oil).

> “No […] no samna baladi […] just oil […] Sometimes corn oil […] sometimes […] no, we do not use olive oil because my husband doesn’t like it […] just corn oil actually”- A1

> “I could cook with sunflower oil or with ghee (samna). I have both”- A2

Local ghee was used mostly by lower SES households. One caregiver reported ghee being cheap, while another reported cooking with whatever was available at the time.

> “Depends on the circumstances and what’s there. I’ll cook with oil or ghee or butter depending on what’s there.”– C7

> “We cook with samna (ghee), our local samna. It’s not expensive, only ten pounds.”- C4

Households in the lower SES areas that did not use ghee cited family illness as a cause while recognising the health impact of ghee. A few lower SES respondents reported their husbands being ill and thus resorting to cook with lighter options.

> “Usually, because her dad has heart problems, I cook with corn oil. Since her father got ill we do not use samna (ghee) and we usually just get samna for the kids from outdoors as samna’s used in making special foods. As for cooking, I only use corn oil.”- C2

In terms of salty food, many households reported eating pickled vegetables or mekhalel (salted and pickled vegetables - a local favourite) at lunch, but the degree to which they indulged in it differed. It was noticed in the interviews that greater lower SES area respondents reported greater consumption of mekhalel - some described it as essential – whereas lower and higher middle SES families ate lesser amounts, some rarely had mekhalel on the table.

> "Yes. Mekhalel is essential. I'm trying to cut down my salt intake, because it's high ... But to everyone else at home, they eat this regularly."- C6

> "Very little."- T4

> "No[…] rarely. I never buy it or make it. "- T5

Many families that had dessert ate fruit, regardless of area. This is probably due to the availability and cheap cost of locally grown fruit.

> "It's not sweets as much. It's mainly fruits."- T4

> "Not every day […] (but) Yes"- C5

> "Fruit. We usually have fruits [...] very few times I'd make cake or bassboosa (Egyptian sweet dessert), but I always have to have fruit, and I always give my daughter a box of fruits to take to school."- C3

Some middle SES (lower and higher) respondents reported having other sweet options for dessert, including chocolate and crisps.

> "A while ago, only fruits. Now since they are underweight [...] I have three kids, the three are thin. Because they are underweight, I started getting biscuits and chocolates and stuff like that [...] I used to allow only fruit, now they have crisps and chocolates."- T5

> "I have a problem with chocolate. Whenever there's chocolate at home, I eat it. I can't hold myself back from chocolate." - A4

The interviews revealed that several food items were found on all dining tables regardless of SES. Meat, particularly chicken was the most reported item, and rice and local vegetable meals were staple dishes. However, the lower SES areas reported consuming whatever was available (and affordable) at the time. These meals were cooked with oils among the middle SES areas, and with ghee in the low SES area considering none of the family had any medical conditions or illnesses. Salt (particularly mekhalel) was consumed in most households, but in great amounts among low SES respondents. Desserts included fruit for the whole sample; however, middle SES provided unhealthier options – chocolates and crisps. When observing the whole sample, lunches at home, usually eaten by the family after working hours, are quite dense and include heavy options – chicken, beef, rice, mekhalel – alongside lighter healthier options – vegetable dishes and fruit.

5.13.3 Dinners

Dinners were generally small across the sample. The majority of caregivers living in lower SES areas reported eating what was available and leftovers from lunch.

> “When it comes to dinner, we eat whatever’s there.”- C2

> “Whatever’s left over from lunch.”- C5

> “Sometimes fruit, sometimes we drink […] a cup of milk […] we do not like to eat dinner.” – A1

Dinner options were sometimes light, such as yogurt.

> “Dinner […] em, she could take yogurt”- C3

> “Dinner is sometimes yogurt or small sandwich with milk, something like that”- T1

> “They eat sandwiches, halawa, and yogurt”- T6

Several households offered unhealthier options for dinner, including cake slices, pizza slices, feteer, sandwiches (greasy cheese sandwiches) and halawa, an extremely local delicacy made of ground sesame, tahini and sugar.

> "During dinner they usually have cheese […] they do not have anything cooked […] they usually have cheese and bread and […] and sometimes my daughter orders halawa a lot […] and eggs […] halawa and eggs […]"- C1

> "For dinner, if I am invited out for dinner I eat. If I'm at home, I do not eat dinner. The kids' dinner could be cake, or a sandwich"- T5

> "Possibly juice, pizza, feteer, sandwich. It differs. One day this, one day that."- T4

Again, the majority of the sample across all SES areas ate less for dinner, especially leftovers from lunch. As with lunch, the welfare of the household led to unhealthy options in both the lower SES and higher SES areas. The low SES area respondents' reason behind little eating was economical; they ate whatever was available/left over from lunch. This sometimes led the lower SES areas to indulge in cheap, filling and energy dense food (eg. halawa and bread). Middle SES households - economically better off than low SES areas - spent on unhealthy (sometimes pricier) options in order to feed their household (pizza slices, cake etc).

5.13.4 Snacks

Caregivers reported that their children were the family members most likely to engage in snacks, although some admitted to snacking themselves. Numerous respondents across all classes reported their children eating quite unhealthy foods (chocolate, crisps) as snacks, even though some of them know these options are unhealthy and are trying to reduce their children's intake of these food items.

> "Yes my children they love to buy crisps and my daughter loves chocolate […]" – C1

"I try not to eat snacks myself, because I'm trying to lose weight, but the kids could eat candy or chocolates. That's a must have for them. There's also Pringles and Doritos and this is daily [...] but I'm trying to have them cut down to once a day and not more than that."- A4

"(My daughter and I eat) Chocolate"- A2

"Waffles and crepes. We do not have chocolate or candy"- T6

Families also sometimes consumed fruit, either as juice or as solid fruit. Most of the respondents who did so were from lower middle SES areas.

"Throughout the day we can take fruit in the form of juice"- T3

"I always give my daughter a box of fruits to take to school."- A3

Crisps were found to be a very popular snack option among all SES areas investigated. However, low SES area respondents provided (cheap) fruit as snacks for the households, while higher SES area respondents provided chocolate, waffles and crepes. Again, this stems from the SES differences between households and affordability. Throughout the food patterns section, it is noticed that all three SES areas engaged in unhealthy eating behaviours, but the main difference is that lower SES areas opted for cheap unhealthy local food and cooking ingredients (pickles, samna, halawa, feteer) while higher SES areas chose more costly imported unhealthy food (pizzas, waffles, crepes, chocolate).

5.14 Account of Children's PA habits

The following section highlights caregivers' accounts of their own children's PA habits, including extra-curricular activities, football, house chores, active play, family outings and cycling. Parent's satisfaction with their children's PA and their opinions on PA in general are discussed later in section 5.19.

Table 5.3. Egyptian children's PA Habits

Children's PA Habits Question Items	Responses
Extra-curricular activities	Little/ no engagement, especially low and low middle SES
Football	Most popular sport, most children engaged, most were members of teams outside schools
Helping with house chores	All SES children helped with chores, some daughters deemed 'too lazy' to help
Active play indoors and outdoors	All SES children engaged in active play
Gym/Sporting Club Members	Reported by parents with sons, not by parents with daughters
Family outings to parks and clubs	Middle SES children engaged in frequent weekly trips and outings. Low SES children rarely engaged, due to time constraints, family finances, and parental health.
Cycling to school	None of the children cycled
Walking to school	Low SES children often walked to schools, which were close by. Middle SES children used buses or cars to get to far away schools.

Caregivers were asked to report the PA that their children engaged in. Table 5.3 summarises the findings of this question. Responses to which activities children engaged in were analysed deductively, as the categories within PA habits section were already pre-determined. Following this, several caregivers gave valuable insights regarding specific types of activities their children engaged in, which allowed for inductive analysis. Moreover, inductive analysis was also used to examine whether there were any SES differences with respect to children's PA.

With regards to children's PA at school, twelve respondents reported that their child was not a part of any extra-curricular sports programme or part of a school team. These responses mainly came from low and lower middle SES residents. Among these respondents who denied that their child was in any extra-curricular activity, a few mentioned that their children did engage in PA in school, just not in any sports programme. These children played football during lunchtimes and in PE classes, were members of the local sporting club football teams or played sports in the neighbourhood.

"He's a member of a sporting club. […]No (not a school club)"- C5

"They're not part of anything, but I know they go out and they play football here and there in the neighbourhood."- C6

"She does engage. Every day during breaktime, she plays football with her coach."- T4

It is interesting to note that those who reported their children participating in these sports lived in low and lower middle SES areas. The higher reporting of PA in the neighbourhood and in the sporting club may be due to the absence of other means of entertainment, including sedentary activities, which may be available to children in higher SES areas.

Most of the sample (except for one) affirmed that their children help them to some degree with household chores such as dishwashing or changing bedsheets. Some helped often, some less so.

"Not always. Sometimes she's lazy."- C1

"Of course (she helps)"- T3

"She helps me with my younger son, not the housework, so I can't really answer yes or no […] she helps me in the housework. He's a little devil at home, so you know, yes "- T2

The majority also reported that their children engage in active play during the day such as running and playing both indoors and outdoors.

"He plays too much. This play gets me problems. "- C7

"Yes, (he plays actively) a lot."- A4

"Of course (he plays actively a lot)"- T5

The two children who rarely helped in household chores and did not play were female, and in both instances the caregivers described them as 'lazy'. The notion that boys are more active than girls was also mentioned by a caregiver who was describing her son and daughter's active play:

"Look [...] it's the boy who plays alot. It's normal for him to play because he's a boy. The girl goes to school and back, and she plays at home."- C6

Numerous respondents reported their children visited the local sporting club or a sports centre/gym.

"Just the sporting club."- C6

"Sometimes (goes to gym) with his father"- A1

"He goes to the sporting club."- T5

There was no evident SES difference between those who did or did not go to gym, but there was noticeably a gender difference. None of the respondents with daughters reported their girls being members of a gym or sporting club.

When asked about family outings to sporting clubs or parks, the practice and frequency differed with respect to SES area. Some caregivers from lower SES areas reported rarely going or not going at all. This was due to various reasons, including finances, time and family health.

"We can't. Both the finances and the time do not allow it."- C6

"No we do not go anywhere, my husband is ill, we can't go anywhere. Even on my holiday, I only go to visit my sister who lives very near us. I go spend half an hour with her and she begs me not to leave, but I have to go home and cook for my husband. The poor man, he's sick and he needs me"- C4

"No… you see my husband is ill ... so whenever I want to take my kids out, I usually take them out near our home. We just walk and it's in Eid [a religious or public holiday], but because my husband is ill I can't go out much."- C1

Families (mainly from middle SES areas) reported going to the local sporting club or park more frequently, usually weekly, particularly on weekends, although some lower SES households did the same.

"Yes we go to parks a lot "- C2

"Yes, at least once a week."- T1

"Yes. We do on weekends, and in the summer, everyday."- T5

Another SES difference was noticed when asked whether children walked or cycled to school or whether they resorted to other modes of transportation. With respect to cycling to school, none of the caregivers reported children doing so. One caregiver, from a higher middle SES area, gave some interesting cultural insights on bicycles.

"Cycling is usually around the house over here. But cycling to school, never. [...] I mean where I live I see children in the street with bicycles that their parents got them. But it's around the house and there aren't many cars about. You do find these things but in a different standards of area [...]You will find bicycles on the street, but in areas of a lower standard. Especially when you got to national (low standard) schools."- T5

With respect to walking to school, higher SES residents mainly reported their children never walk to school due to distance, which implies the use of sedentary modes of transportation – travelling on (family) cars or school buses to get to school.

"No, because it's a very long distance to school."- T1

"No, by car. He goes by car."- T6

Numerous lower SES parents reported their children walking to school.

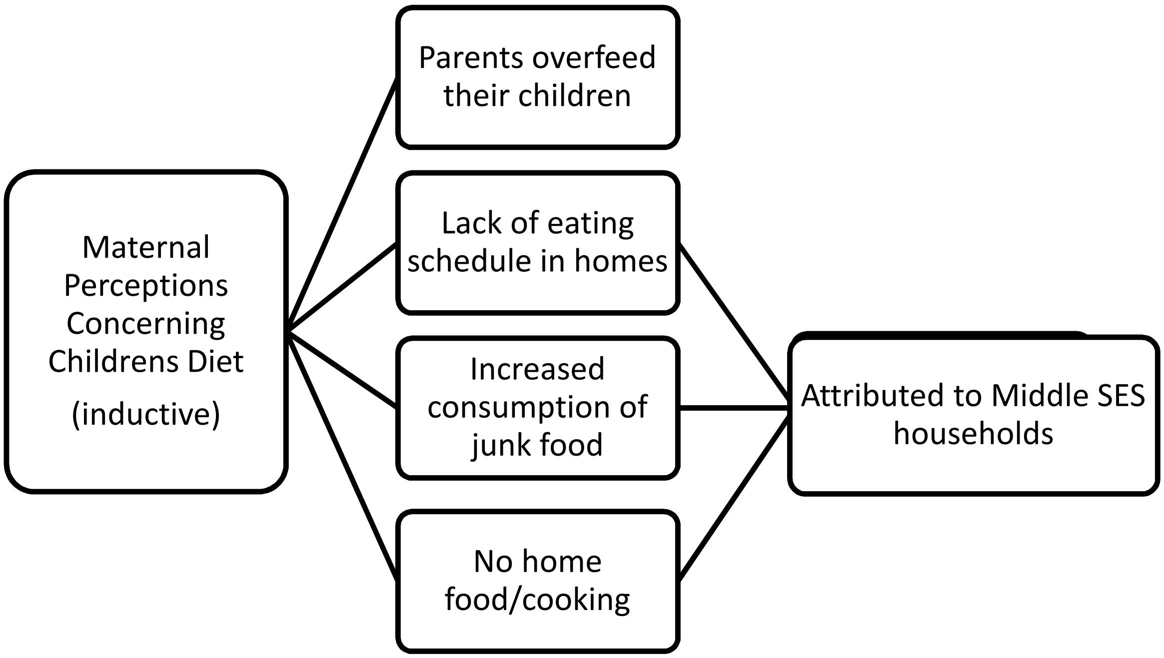
"No she walks to school, her school's very near to us. It's very near to us."- C4

An explanation for this may be that lower SES families in Egypt generally enroll their children in their local neighbourhood's government schools which are cheap and easily accessible on foot – which would also save the family transportation costs. Higher SES residents may enroll their children in more expensive schools which could be quite distant from home, thus preferring more suitable, sedentary and safe means of getting their children to school.

Respondents' accounts of their children's PA revealed that the difference between children's PA levels was gender-based. Boys tended to be more active, while girls were quite sedentary. This might be due to gender roles and perceptions. With respect to SES, children from the three SES areas practised PA, but these differed within the SES area in question. With regards to active play, all children from different SES areas engaged in active play, and all helped with housework. While higher middle SES area children were exposed to PA encouraging environments through family activities, such as frequent visits to the parks and sporting clubs, they did not walk or cycle to school. Lower SES area children had less exposure to PA encouraging environments through their families, who did not do any group PA due to illness, time and financial constraints, but practised PA through other activities such as walking to their nearby local schools and playing in the neighbourhood.

5.15 Maternal Perceptions Concerning Children's Diet

Figure 5.2. Maternal perceptions concerning children's diet



At the end of the semi-structured interviews, respondents were asked to give their own opinions on obesity in Egypt – on both prevalence and causes. Figure 5.2 summarises the responses, and this question employed inductive analysis, in that it relied upon responses to generate codes. When asked about the reasons behind obesity, feeding practices employed by parents towards their children were mentioned by numerous parents who deeply criticized the way parents dealt with their child's nutrition. Respondents reported that parents tended to over feed their children in Egypt, and often used unhealthy food as a reward for good behaviour or finishing their plate.

> "I've seen parents, even when I'm sitting in the club, pushing their kids to eat and eat. He's not hungry, just let go of him. If he doesn't want to eat […] we do not do this here in Egypt. A huge plate of rice, with a huge amount of vegetables on top, and you have to finish this or else you're not going anywhere. No! If he's hungry he's not going to […] I've seen the parents. This way, you parent are expanding your child's

waist, because that food later won't be that much. To fill him up. The thing is " If you do this, I'll give you a chocolate bar." "If you do that I'll get you candy". No! No... if the initial food is healthy, it doesn't mean I reward him with chocolate and candy . No. "I'll take you somewhere. We'll do this and that. I'll buy you clothes." I've seen it infront of me, you know what I mean? "- T2

"Let me tell you that in Egypt, the reason behind our kids being fat is because firstly we think that kids that are fat are healthy. We do not think that being healthy means eating a healthy amount, having healthy cholesterol levels etc. [The parents] see fullness as healthiness. On top of that, they feed their kids in a horrible manner, overly, or the food quality itself is horrible. Of course for these people salad, and fruits are not considered real food, the real food for them is of course rice, cooked vegetables, chicken and meat. You get my point? On top of that, in between meals they go 'Here son, take some chocolate, take some crisps'"- A4

The previous comments from the two caregivers revealed that there may be a trend of overfeeding children in Egypt. Both caregivers also mentioned that parents tend to use unhealthy food as a reward for good behaviour or healthy eating. The second caregiver's insight into parents' perception of plump and full children being healthy may be the reason behind this. This might also explain why almost all respondents did not perceive their children as having an extra weight problem. The reference children may indeed belong to a healthy weight category, and under ideal circumstances they could have been measured – however this study was unable to. However, it may be that parents' perceptions of adult weight and childhood weight differ; most caregivers identified themselves as obese and several focused on adults when allowed to freely talk about obesity trends in Egypt. Moreover, a third respondent also mentioned that parents may sometimes be stubborn and rigid in their perceptions of their child's weight, which may make addressing the issue difficult.

"The problem is with addressing people here. Not many people will agree with your point of view, even if it's right. You can't tell a person their child is fatter than yours.

If the person can accept a criticism, you should tell them. But for many people, it's not the case."- C3

Additionally, several respondents mentioned eating schedules as a potential factor behind adult and childhood obesity in Egypt. They criticised the lack of timed meals, and the random eating hours, mentioning this in a very self-critical tone sometimes.

"Also, in the summer, I see kids eat at 1 and 2 in the morning in the summer resorts. You probably know about this right? They eat at a very late hour. Apart from the fact that we're messed up. We sleep at 2 and 3 am, and consequently the food pattern is screwed up. And we eat a lot at night, and we wake up and have breakfast at 11 that's huge, and then a very heavy lunch, and in between, cookies and cake and I do not know what. I see all Egyptian families like that. Most of them."- T2

"[…] uhhm it's all from bad habits […] there's no kind of […] I mean even a long time ago before the 80's and 90's, we didn't have this. We had a fixed time. I remember papa, whenever he got home we had to be at the table at home. That was probably the cause of proper food burning. These days the problem is that we do not have a fixed time for any meals. Once you wake up, you're going to take breakfast or not or you will drop this meal. And when you're free, eat. I think this is what's making a huge problem for us."- T3

"The parents of all these kids stay up all night and sleep all day, and the kid can't find any sandwiches or fruits or anything, and all he has is his weekly allowance of say 50 or 60 pounds, so he goes and gets food with them [...] whatever really, pizza, Kentucky in the morning. They take the drivers to the restaurants and take food to-go on their way to school. They go home and the woman of the house is asleep, she was asleep all morning you see. And the mothers get up to the same routine. While the kid's going to sleep the mother's starting her day. It's either that or that the mother works somewhere all day and she doesn't come back till night time."- A4

The last few critiques, all by respondents from middle SES areas, highlight an important SES issue. These women reported that children have too much money and not enough parental attention to eat properly, or they see children eating at unusual hours in Egyptian resort towns. Having too much money and spending on junk food is a middle SES issue, as low SES households would not be able to afford such junk food – given their consumption of cheap and available local food. Furthermore, middle SES families own summer houses in seaside resorts on the Mediterranean and Red Sea coasts. Elements of the lifestyle of middle SES classes were increasingly reported as a factor behind unusual eating patterns. Moreover, it is interesting how the respondents who were quite vocal about their opinions came from the lower middle and higher middle SES groups. The low SES residents did not give an opinion on eating patterns. This might be due once again to affordability and resorting to eating what is available and economically viable. Another interesting observation is that one of the respondents reported afterwards that many students at school presented with sore stomachs. She attributed this to the lack of eating at home and the increased consumption of outdoors food like fast food chains. She further backed her claims by reporting that one student never saw her mother preparing food in the kitchen.

The quotes above indicate that middle SES children are exposed to unhealthier eating environments – no home food, eating outdoor food, no eating schedules – something that, from the interviews, was not mentioned with regards to low SES areas.

5.16 Respondents’ Perceptions of their own weight and Egyptian women’s Weight

Figure 5.3. Respondents perception of their own weight and Egyptian women’s obesity

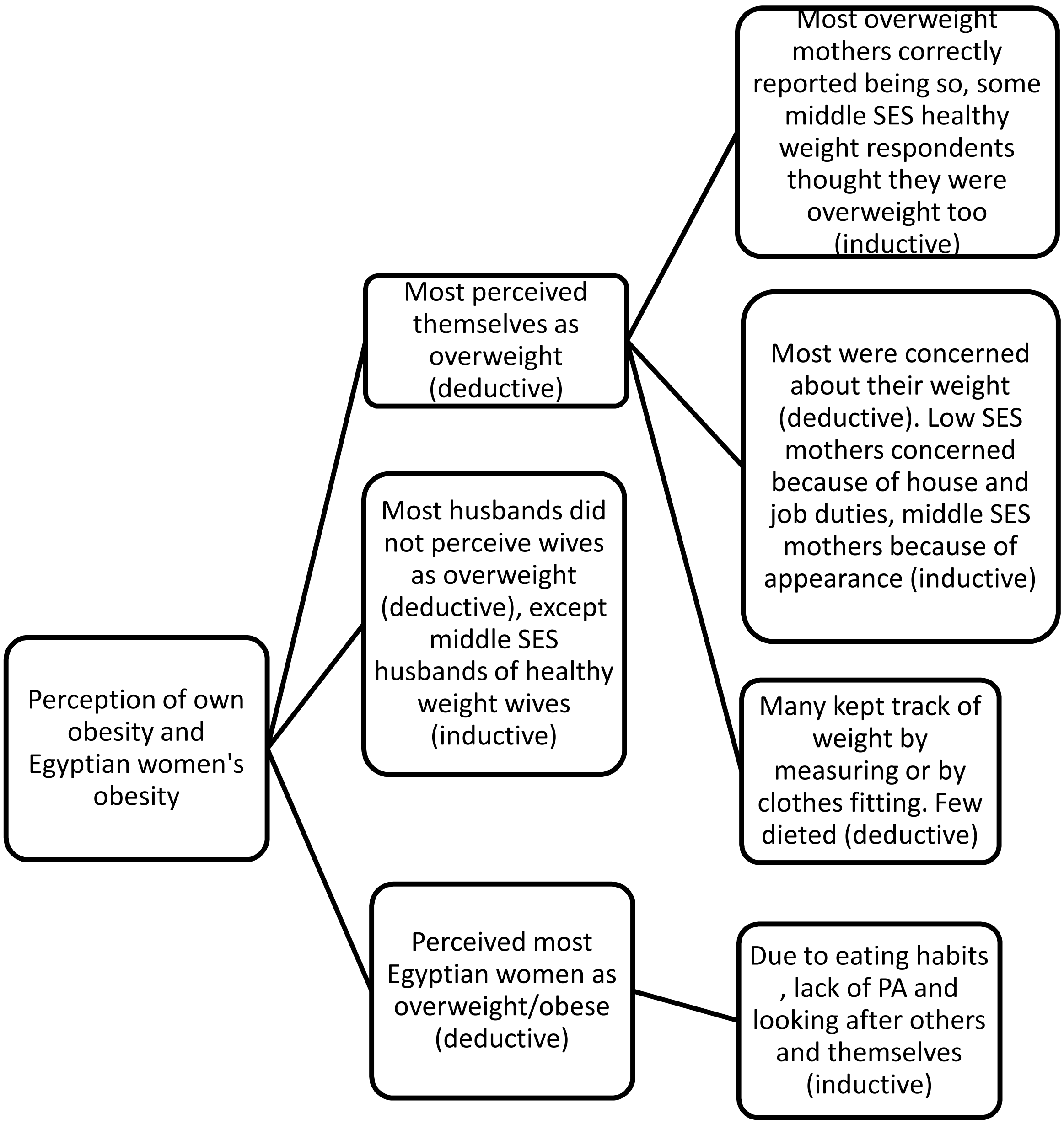


Figure 5.3 highlights respondents’ views of their own weight and on Egyptian women’s weight in general. When inquiring about mothers’ perceptions of themselves as obese, their concern about their own weight gain, their husbands perception of them as

obese, and how/whether they weighed themselves and whether they perceived obesity to be a female issue, responses were analysed deductively (as they were Yes/No responses). Women's perception of their weight was compared with their actual BMI, and the extraction of potential patterns from this was inductive. Reasons behind maternal concern about their own weight, differences between mothers of different SES in perception, and also reasons behind perceiving obesity to be a woman's issue were all analysed inductively as there were no pre-existing codes.

When asked about whether they perceived themselves as overweight or obese, the majority of participants perceived themselves to be overweight. Some of the women who perceived themselves as obese felt strongly so, and it obviously affected their image of themselves.

"Yes, I'm horrible. I do not like myself like this to be honest."- C2

"Yes, I am ten kilos over […] if not more. I know. "- T3

"Of course, I think of it too much. I think I am over and I want to lose some weight."- T5

"I think I'm overweight"- T1

A large portion of the respondents had overweight/obese BMIs, and did correctly identify themselves as overweight. Very few participants perceived themselves as having an average weight, and another perceiving herself to be quite underweight.

"No (I'm not overweight) [laughs]"- A2

"Me? I'm almost disappearing [laughs]. I'm way below normal weight."- A3

"No (I'm not overweight). I think I'm average. I'm not that thin, I'm not that fat."- T6

It is interesting that the three women who did not perceive themselves as overweight or obese were from the two middle SES areas investigated. This might be due to greater perception of weight and a more comfortable physical and economic environment enabling them to maintain a healthy lifestyle and weight, thus not needing to worry about physical labor. It was also very interesting to notice that while most overweight or obese caregivers correctly identified themselves as being so, some of the healthy weight mothers perceived themselves as overweight. This might indicate middle SES households and women being exposed to and adopting ideals of thinness – probably international ideas, which they as international school teachers would be easily exposed to.

5.16.1 Respondents' Concern about their Own Weight

In terms of reasons for their concern about gaining weight, responses seemed to indicate that the reasons were less about health and more about conformity to external pressure - their duties and expectations as a wife, mother and working woman. Health seemed secondary; one of the respondents cited her diabetes after stating that the weight would put pressure on her legs (which would impact her duties). Three respondents stated:

> "I'm trying to go on a diet […] so that I could be able to carry out all the housework and help my children "- C1

> "I want to lose weight, because this heavy weight is a burden on my legs and I also have diabetes so I want to lose weight."- C4

> "I just dieted because my husband asked me to."- A2

Examination of the respondents' concern showed that while low SES respondents were concerned mainly for health and functional purposes (being able to carry out daily duties and preventing burden of disease), the higher middle SES areas were more concerned for aesthetic reasons (their husbands asked them to). This might be due to the physical demands placed upon the lower SES women respondents, who were all cleaners in this study.

When concern about overweight was examined with respect to the caregivers' BMI, it was noticed that regardless of weight status, caregivers were concerned about their potential weight gain. The only caregiver who reported not being concerned with her weight was overweight herself and a cleaner living in a low SES area.

5.16.2 Respondents' Perception on Husbands' views on their Weight Status

Respondents were asked to report their perceptions of their husbands' views on their weight status. The interviews revealed that men's perception of women's obesity differed from their own perceptions of themselves. The majority of respondents reported that their own husbands do not perceive them as overweight or obese, even though they saw themselves as such.

"Uh … no, he always says "I like you as you are… as you are""- T3

"No, no no no no. No."- T2

"No, he doesn't say anything. He doesn't object."- C6

In fact, only five out of the 17 respondents' husbands perceived their wives to be over their perceived desired weights. These cases were from across the SES spectrum, but mostly from lower middle and low SES areas. These husbands commented on their wives' weight status regardless of whether they themselves were physically fit or not - one of the husbands was an active police officer and another was overweight himself.

"Yes, yes he has told me "Try to lose weight""- C1

"Yes (my husband tells me that I am overweight)"- C7

"He sometimes shows that he (laughs) doesn't like this"- T1

"He's a police officer and he's got a very athletic body. He's always making me try to lose weight. "– A4

"Yes, all the time he tells me I'm fat [laughs]. And he has a belly himself."- T5

It is interesting that of the five respondents whose husbands perceived them as overweight, two of them had healthy BMIs. These two respondents lived in middle SES areas and were both teachers. Although this is not a huge number, this may be an indication that men's perception of women's weight may differ between SES areas. Moreover, the reason why so many husbands do not have an issue with their wives (especially overweight) may be personal/cultural preferences of women's sizes. Lower middle SES and low SES husbands asked their wives to lose weight, and this might be due to economic pressures, for example worrying if the woman cannot contribute her part (and not be able to work as hard) to contribute effort and money to the running of the household.

5.16.3 Respondents' Keeping Track of their own Weight & Dieting

Most women interviewed kept track of their weight. In fact, only one of the interviewees from a low SES had measured herself for the very first time prior to the interview, when the anthropometric measures were taken by the school physician. The frequency of measurement differed from person to person, but the caregivers who divulged how often they measured themselves using scales measured on a weekly or monthly or bi monthly basis. A couple of caregivers did not use scales to measure themselves; instead relying on how well their clothes fit them to make a conscious decision about their weight and diets.

> "Yes (I weigh myself). […] Once every two months if I want to."- C2

> "Yes (I weigh myself). […] I was 96 kilos and I lost a kilo these days. […] I lost a kilo and I'm still trying to lose weight."- C1

> "No (I do not weigh myself) […] I know from my clothes."- T4

> "It depresses me when I gain weight it does […] when I try my jeans in the morning and it doesn't fit inside it just bothers me right […] yeah […] it bothers me a lot. […] When I try my jeans and I do not fit inside I know that I gained weight so I know I have to go back [laughs]"- T2

"At least every one month I have to check my weight." – T6

Although the concern about gaining weight was reported by the majority, few caregivers from all different SES areas dieted in the past or were dieting at the time of the interview.

"I used to be 95 kilos and I was on a diet for two years consequently […] after this, I tried to lose 35 or 30 kilos"- A1

"I try to limit the amount of food I eat, but I do have breakfast, I do have lunch, I do have dinner, but in small portions."- T6

Once again, both teachers from middle SES areas with healthy weights reported dieting, which may again indicate a different ideal in middle SES areas and low SES areas. Very few overweight/obese caregivers were on diets. Only one of them reported visiting a dietician for a dietary regimen.

"And I went to the doctor this month and he gave me a regimen to stick to."- C7

"I just dieted because my husband asked me to."- A2

"And after I changed my diet, I dropped to 80 kg"- C5

The low incidence of dieting may be due to the time constraints and responsibilities these working caregivers may face, as throughout the interview the issue of time constraints was a recurring theme among many of the interviewees.

5.16.4 Caregivers' Perceptions of Egyptian Women's Weight Status

All caregivers, regardless of weight, interviewed perceived that overweight and obesity were highly prevalent in Egyptian women. When asked why this was the case in Egypt, the majority – mostly from the higher and lower middle SES areas - attributed the high prevalence to a dietary cause, mostly due to the food quality, and also due to daily eating routines.

"… because they eat a lot of foods that are high in fats like mahshi (dolma)!"- C6

"Because they are attracted to fatty foods, grilled fatty foods."- A3

"The way we (women) eat is quite bad. We do not ermm [...] I like to observe what Americans eat, they eat alot of fruit, vegetables, grilled fish, but we do not have that. We prepare the fish with oils. We have dolma and macaroni and our type of food is different to them. They do not have dolma and macaroni béchamel but they do have pasta and mayonnaise and burgers and things like that that are loaded with fats, but I do not think that that's what they usually eat. I think they may have it once or twice. I think for example with corn they cook it, or they might make some salad, put some chicken on it and that's their lunch, but we do not do that. We have to have a plate of rice, a plate of mahshi (dolma), a plate of cooked vegetables and a plate with bread to dip. So I think we eat carbohydrates more than healthy food. "- A4

"Because of the style of cooking and the way they eat, and the random timing of their meals, and I also think the portions, the amount of food they take is a little bit extra."- T6

This focus on eating could perhaps be due to a possible belief that the responsibilities and duties they carry out constitute physical exercise, which was the opinion of a couple of interviewees who believed that their daily routines go towards their PA levels.

"No… My friend, she moves a lot, but she's very fat."- A1

"I move a lot."- C2

Interestingly, these two caregivers were from the lower middle and low SES areas. This may imply that they do carry out more physically demanding tasks during the day. This is true for those who are from the low SES areas, as all of them are cleaners at the school, and their job demands are mainly physical.

Some respondents attributed the cause of obesity to both eating and lack of physical activity. The majority who voiced this opinion were women in their early 30's from the lower SES area.

> "Most of them [...] they do not move alot. They have bad [...] they have bad eating habits. They eat anything at anytime and they have soft drinks and they have coke and alot of sweets like gateaux and cakes"- T5

> "I do not know, maybe because there's no consistent food routine due to having so many errands to run. I think it's exercise and also food. Both together"- C3

> "It might be because [...] there are those that tell you 'I eat when my psychological state is bad' and there are those that just like food, and there are others that eat and do not move."- C7

Other caregivers had different opinions on the impact of duties and responsibilities (both physical and food related). These errands and duties were identified as a determinant of obesity by a few respondents from different SES areas.

> "I mean, they do not really look after themselves. What to say? They're looking after their homes, and their family's food. They aren't looking after themselves."- C1

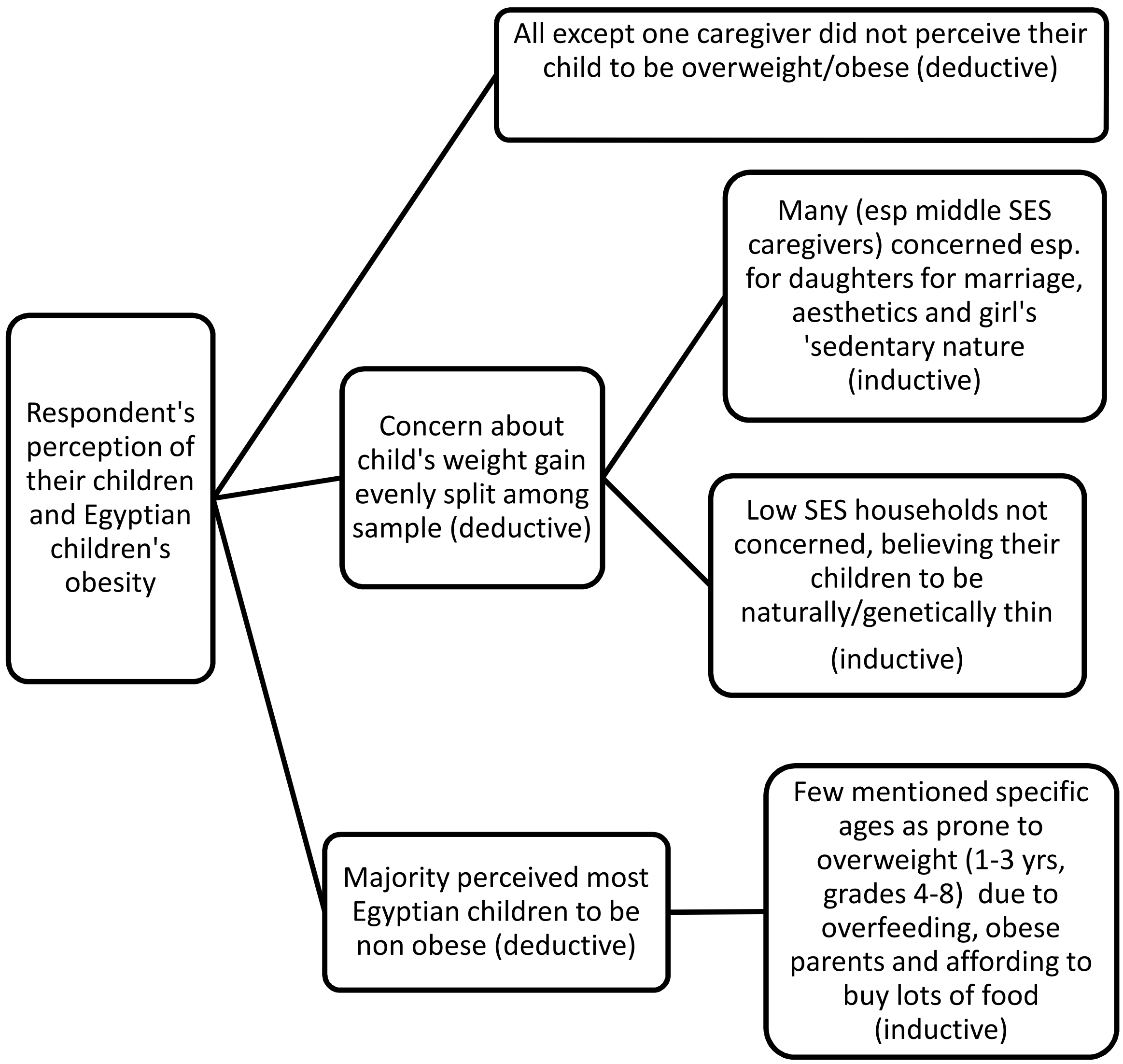
> "They do not take enough care of themselves. I mean, they are just caring for their children, their house, everything but themselves. That's why it's rare that anyone thinks of dieting and sticking to it. I mean, I'll think 'Oh I'm making a diet for myself only and not other people?' "- T1

Time constraints regarding their duties towards their homes has resulted in caregivers not having enough time to better their own health and exercise patterns.

The observation that the majority of women in Egypt are overweight or obese coincides with existing data on obesity prevalence in Egypt, particularly the fact that Egypt ranks 14th globally in obesity prevalence among women aged 15+ (48%) (WHO Global Infobase, 2010). The perception that food is the main reason behind obesity in the majority of the sample, supported by the dietary patters examined in the first section, indicates that food is a major cause behind women's obesity in Egypt.

5.17 Respondents' Perceptions of their Children

Figure 5.4. Respondent's perception of their children and of Egyptian children's obesity.



Caregivers were asked on their perception of their own child's obesity, whether they were concerned about their child gaining weight (and if concern was gender based) as well as their perception on whether obesity was an Egyptian childhood issue (Fig 5.4). All questions were 'yes/no' responses, and all but one (whether they perceived their children to be overweight/obese) required them to elaborate. The first question was therefore analysed deductively, while the elaborations to the other responses were analysed inductively.

5.17.1 Respondents' Perceptions of Their Own Children's Weight Status

All but one interviewee (who was overweight) did not perceive their child to be overweight or obese. Some caregivers, particularly those from lower SES areas reported their child to be extremely underweight, one caregiver even worrying about her daughter's health.

> "No, her body's fine"- C7

> "Not at all, in fact I think that she's thin or petite. I mean, she doesn't exert much effort because she's so weak."- T5

> "No, they aren't overweight or obese, and it's very obvious on them. [...] My daughter for example is 55 kilos."- A4

Unfortunately, reference children were not measured in this phase of the study, therefore the accuracy of their statements is questionable. Their children may be overweight or obese, and if so, this might coincide with the numerous studies that state that parents had healthier perception of their child's weight than what anthropometric measurements revealed (Myers & Vargas, 2000; He, 2007; Towns & D'Auria, 2009; Taylor, 2012). What is evident from the data is that a massive difference existed between mothers' perceptions of their own weight and perception of their children's weight.

5.17.2 Respondents' concern over their children gaining weight

In terms of concern about their children gaining weight, participants were evenly divided. Some parents were not concerned.

> "Not really, because fatness doesn't run in our family."- C7

"They're both extremely thin. They are both like their father, he's very thin. Genetics. It's either the mother or the father's genes. The thin child will always remain thin"- C3

"No (I'm not concerned)"- T3

Some parents from low SES areas claimed their children were naturally thin, and were confident that their kids would not gain weight in the future. Some attributed this to family genetics. It is interesting to note that some of the caregivers who were not concerned about their child's weight gain were overweight/obese themselves. This could be a result of their perceptions that overweight is an adult woman's problem.

Some mothers were vocal in their concern over their children's potential weight gain.

"I do not like it because I feel that it's going to destroy their life if they are overweight or obese. They will not be attractive to the girls, and this will affect them mentally."- T6

"No I want her pretty and not obese of course."- C1

"Yes (I am concerned) […] especially for my daughter"- A2

Most of the concern was voiced by mothers in middle SES households, regardless of their own weight status. This might be because of more awareness or educational background on health issues. There is an evident SES difference with respect to concern over childhood obesity. Parents from low SES areas may conclude that their children's thinness may be inherent and that the amount of eating and exercise would not change this. The middle SES areas studied may be more concerned due to the financial ability to engage in unhealthy eating, particularly outdoor fast food chains and restaurants, sweets etc.

5.17.3 Gender- based Concerns of Children's Weight Gain

Respondents revealed that the concern for their children's potential weight gain is primarily aesthetic or social. The statements in the previous section regarding concerns over the daughter were expected, which is why the follow-up question was whether respondents were more concerned about their sons or daughters gaining weight. This question revealed that the thinness & attractiveness ideal was more gender and SES specific. Few households, mostly overweight/obese caregivers from the lower SES areas, said they would be equally concerned if their sons or daughters were to gain weight.

> "Generally it's the boy and the girl, they are like each other. It's important for movement and exercise so that they come and go"- C1

> "Both […] both […] overweight is not healthy for even the children to walk or for their daily activities … it will make them give off a bad impression and they are not going to play with the other kids and …. They are not going to be happy when they are playing and they will always be … they want to sit and keep sitting […] and I do not like this because this won't do haha"- T3

However, an overwhelming majority were more concerned about their daughters gaining weight than their sons. The caregivers who provided a justification cited future chances of marriage as a cause.

> "I'll tell you something. I'm concerned about both (my sons and daughter), but mainly about the daughter. Firstly she is a woman, or she will be a woman and she has to have a good body so that she doesn't suffer in her life. That's one thing […] But the daughter's appearance is number one. If a girl is obese here, it's hard for her to get married, so that you know. She has to have a lot of other good qualities to counter that. We are talking about limits. For example I got married and I was obese, it depends on the kind of obesity. There's a kind [of obesity] that's over the weight limit which is disfiguring and it's impossible for a girl to get married when she looks like that."- A4

> "The girl has to have a good body shape. She has to look good. But in terms of boys, they do not look at appearance and whether he's thin or fat, they look more on personality. With a girl, first impressions are always made from her looks."- T5

> “Yes […] especially for my daughter […] Because one day they will get fat anyways [laughs]. I mean, with pregnancy, she will be fatter obviously.”- A2

Moreover, several parents gave more permission to boys to be overweight. These parents believed that men will definitely marry regardless of their weight and appearance. They also seemed more lenient in their treatment of boys than to girls (eg. giving them more freedom to eat).

> “With regards to the boy, of course obesity is bad for the health, but he’s a man [...] I won’t lie to you, a man’s a man and he’ll definitely get married, but a girl won’t if she’s fat [...] as for the health aspect of it I’m worried about both. I mean, I won’t let my son be 100 and bla bla bla kilos but if I see that he likes food then I can’t deny him food. […] But I can take a stand with my daughter and prevent her from eating if that has an impact on her appearance, you get my drift? But I also will take a stand with my son if I find that it is having an impact on his life and on his appearance.”- A4

> “If the boy’s a fatty, it’s not a problem anyways.”- A2

Even though men having extra weight may be visually unappealing, the weight requirements for a man seem to be more lenient than women’s weight requirements. When this question was asked to a respondent, the interview was interrupted by another staff member (who had something to ask of the teacher being interviewed). Upon hearing the question the following conversation between the two occurred:

> Other staff member: “Of course it’s a problem. If someone obese had come up to me and asked my hand in marriage, I’d have refused.”

> Interviewee: “Actually me too […] if he gets too obese. But if he’s a bit chubby it’s not a problem. “- A2

It is concluded from the interviews that there is a much greater pressure for girls to conform to a weight ideal than for boys. Responses indicate that the main reasons behind this pressure are culturally determined roles and expectations (weight ideals, role of women in society as a caregiver). The prevalent perception is that a woman must be physically appealing, whereas a man is perhaps judged on other criteria (probably financial status and occupation being able to provide for a household).

5.17.4 Respondents' Perceptions of Egyptian Children's Obesity

Respondents were asked whether they believed Egyptian children were generally overweight or obese, based on their daily observations in the school environment and in the Egyptian setting. Several respondents did not believe that the majority of Egyptian children were overweight or obese.

> "No not all of them. It's only the adults that are (overweight and obese). The majority of kids are thin."- C1

> "No. Not at all.[…] No, the majority are not fat no."- A3

> "I do not think so. […] I see them here in school, around here mainly. […] so mainly […] maybe it's just them, maybe it's just their homes"- A1

> "No (Egyptian children aren't obese) because they are hyper-active [laughs]"- T3

> "No, in school, not that I've noticed.[…] They do, but most of them not, no. […]We have a number, but it's a minority i guess."- T2

Few interviewees believed obesity in children was age specific.

> "Yes, I think from grade 3-4 until grade 8 (are overweight) […] Both of them (boys and girls) […] In this age I think they both the same, in everything. They start to become boys and girls respectively in grade 9 and they think to themselves 'we've got to be different'."- T1

> "(Children from age) 1 to 3, when we sit with them and feed them just about anything."- C7

When asked about the reasons behind children being overweight and obese, most interviewees regardless of SES area or weight status attributed weight status to an aspect of the home environment – namely the parents. Parents were often cited as factors through various pathways. Feeding practices were mentioned the most, with interviewees believing that parents overfeed their children, and one caregiver mentioned parental obesity as an influence.

> "…they become fat because their mothers feed them too much.'- C7

> "Some mothers concentrate on fattening their kids, saying 'I'll give them Seven Up, I'll load them with grilled food.'"– C3

> "It's probably because of the mother. When she sees her son getting bigger, she thinks his health is good."- C5

> "It's […] because of the bad food habits. They eat a lot, and it's like the mothers hand is constantly in the child's mouth feeding him. We feed the body more than we feed the mind. Of course I'm talking to you about the majority of Egyptian households but some households of course do not do this."- A4

> "I think it's because of the home. Basically, they will have obese parents. The kids grow up like them, there are no external influences here."- T5

Moreover, two respondents attributed childhood overweight and obesity to socio-economic reasons. The two caregivers in question were from the opposite ends of the SES range, and both identified wealth as a cause.

> "There are those of my daughter's age that are huge, and there are others that are thin. There are those who get tons of food and eat tons of food, and there are those who get food according to their little budget."- C4

> "The low (SES) category. I think that with highly educated people, their main concern is the health of their kids. I think that even if they have a boy who's a little bit overweight they go and check with the doctors."- T6

The first caregiver implied that affluence (or lack of) led to either a higher consumption of food, or a consumption of unhealthy cheap food. However, she stressed the tons of food, and it seemed like this was due to the easy accessibility and subsequent consumption of food. The higher SES respondent also identified the opposite end of the SES spectrum, citing lower SES children as more obese due to wealthier SES's concerns for their children's health. However, her rationale implies that she has seen obesity in higher SES children. Moreover, she mentions affordability to see a doctor in the case of obesity – which may imply a more reactive approach by parents to childhood obesity rather than a proactive approach.

Again, the majority of the sample did not perceive Egyptian children to be obese and this may possibly be a misperception of children's obesity. The few who perceived a sizeable prevalence of obesity in children were from lower middle and low SES areas, and this may be due to comparison of their own children with the children they see at school and in society at large – who may be well fed and perhaps larger in size than their own children. Feeding practices, already discussed in the food patterns section in the questionnaire, were highlighted once again as the main factor behind children's obesity.

5.17.5 Obesity in the Extended Family and in Society

Figure 5.5. Maternal perceptions of obesity in the extended family and in society

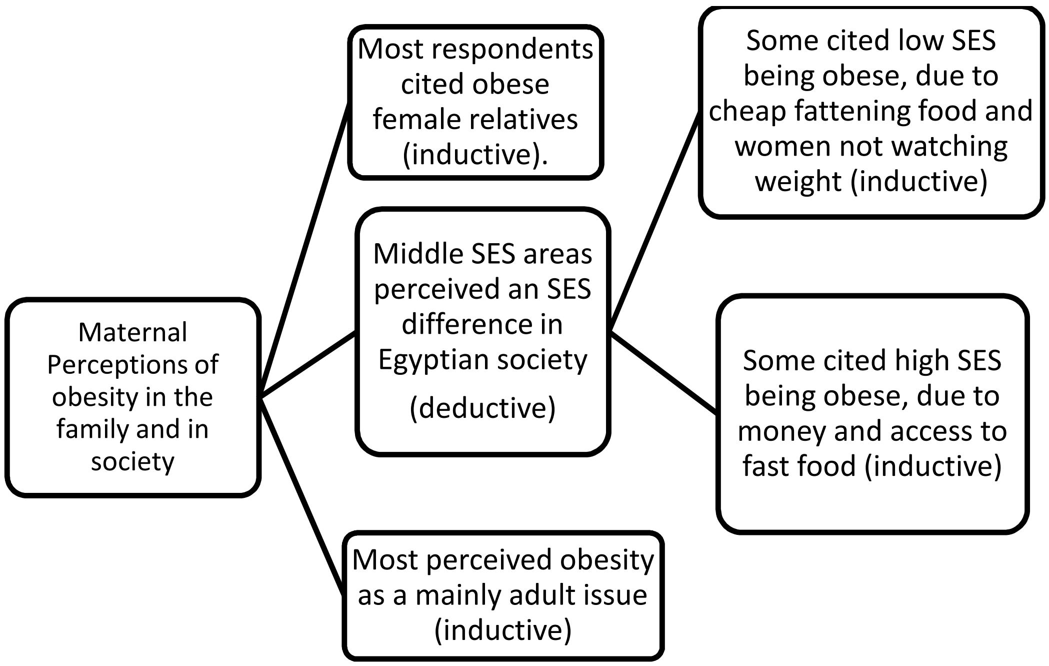


Figure 5.5 reports maternal perceptions of obesity within their extended family, and whether overweight/obesity was exhibited by a certain socio-economic or age group. Since most questions had no prior coding, they were analysed inductively, drawing out themes from the responses. When asked whether they had any overweight or obese relatives, the majority of mothers identified family members who they perceived as overweight or obese. Respondents who identified overweight or obese family members were more likely to report adult female relatives as overweight. These included respondents' mothers, sisters, uncle's wives, sisters in law and aunts.

"Yes (I have obese family members). Especially the ladies. Yes my sisters are fat."– C5

"Yes. My mother, rest in peace, was fat." – C6

"My uncle's wife and my brother's wife. My mom used to be thin when she was younger, when she was working. Then she stopped working to raise us and that's when she became fat. "– C7

"The people who are overweight to an insane degree are my aunts. I have three aunts, they are all like this (puts hands out in shape of a belly). My mother of course is also overweight, sometimes she can't walk on her legs because of the weight [...]" – A4

"Yes. My sister is […] since she was two years old."– T1

"Yes. (My husband's) brother's older girl is a bit overweight, she's considered in the fat category, because her mother is so."– T6

It is interesting that very few women identified any adult male members of the family as overweight or obese. This might be once again due to cultural perceptions and greater physical scrutiny of women. This also coincides with studies in Egypt which show that women are a very vulnerable group to overweight and obesity (EDHS, 2008; WHO, 2010). It is also very interesting that a large number of women who reported having overweight female relatives were from low or lower middle SES areas. This is similar to when they were asked if they perceived themselves as overweight or obese. Although the large majority thought they themselves were obese, the few who did not were from middle SES areas – particularly the higher middle SES area respondents. In this question, only one higher middle respondent reported her husband's sister-in-law and niece to be overweight. In fact, four of the five higher middle SES respondents reported having no overweight or obese relatives. In addition to the respondent who reported her niece to be overweight, two other respondents identified children family members to be overweight or obese. Both these respondents came from the lower middle SES (aged 30, who identified her nephew and niece as overweight) and higher middle SES areas (age 31, who reported her cousin's children to be obese). This section seems to point towards a higher overweight prevalence in lower SES areas, particularly among women.

With respect to perceptions of obesity in Egyptian society, respondents perceived that obesity was mainly an adult issue in Egypt. Some stressed that women were the group with the highest obesity prevalence, while some saw that both sexes as adults were equally obese and one thought women took better care of themselves than men. This view that obesity is an adult issue transcended SES area.

> "Yes, the Egyptian woman is more prone to obesity. Probably hormones … that may be why there's a higher chance. And also its' different for a girl, because she gets married and she gives birth"- T4

> "Yes (women). It's because of the stay at home, the lack of movement, the constant TV watching, and eating without burning fats."– C5

> "Ah ok…actually women. They are overweight a lot. Also men after they get married. […] After they get married, they stopped caring about themselves, not going to any sports. […] I think after marriage. They always do after marriage. "- T3

> "In our age, no. I feel that women take care of themselves more than men […] my husband have this problem, due to his work, but he wants to look good."- A2

> "I notice that fat men are always the ones who are sitting at work and just go home to eat and sleep. It's the same with women, eating and sleeping is a common habit in Egypt. With respect to women, it's from when they sit and home and they eat anything between meals, whether sweets or fried foods, and there is no organisation in terms of eating time and content. With men, it's because of sleeping and eating and always being at work all day. "- A3

Either way, two themes emerge from the responses above, regardless of which gender is believed to exhibit more overweight/obesity. The first is that marriage, which from the literature review is regarded as an essential rite of Egyptian society (Aldinger & Bauernfield, 2001), is the point where adults (regardless of gender) start exhibiting overweight and obesity. It seems that prior to marriage, both genders- women much more so than men – adhere to a desired physical appearance, which loses importance after marriage. Following marriage, both genders follow a traditional Egyptian life pattern, the husband working to support the household, and the mother being the primary home keeper regardless of her working status. Consequently, pregnancy and motherhood further add to the obesity by diverting the parents' attention from themselves to caring for their own child, and pregnancy perhaps taking a physical toll on women. It is also interesting that a large number of women reported male obesity to be an issue, despite rarely reporting many male members as overweight or obese. This may also be indicative of a difference between male members of the family and males in Egyptian society.

The second emergent theme is that respondents attributed the rise in adult obesity to a combination of unhealthy eating habits and sedentary lifestyles. Among these two factors, respondents focused on food much more than exercise in the last question, with respect to themselves as adults and especially with regards to children. Food has been stressed as the cause of obesity consistently in the previous sections of this chapter.

5.17.6 Obesity and Socio Economic Status

Since the study dealt with differences among different SES areas and their impact on obesity, caregivers were also asked whether they thought obesity prevalence differed between different SES classes. Some respondents did not think there was a difference, a common view among those from lower SES households. Some caregivers, mainly those living in lower middle SES and higher middle SES areas perceived a class difference in obesity prevalence.

> "The people in the poor areas do not care if that makes you fat or not. With them, they just thank God that they're eating something. They'll eat whatever."- A2

> "They (richer women) are watchful of their weight and so they are very thin."- C5

> "No, those who live in slums do not have much to eat anyways, so they won't be fat. They won't be fat because they do not have many meals anyways. [...] I had a little girl who was working for me at home. When she came, she was thin, and when she stayed at ours she got fat, and when she went back to her family she lost the weight again. So this means that they do not sit and eat too much when they have a meal.

You will find that those who are fat are those who eat more, and those are people who can afford it. But poor people cannot eat more, so they can't be fat."- T5

"I think in slums, the people who live there are not concerned with keeping track of their time or bodies or sports or how to use the body's energy. But those who live in Shorouk or in Madinet Nasr are more concerned about their bodies, they do not want to be fat, they do not want to be out of breath because of how fat they are. So I think the environment differs. "– A3

"People of low socio economic status, they depend a lot on bread, which is the cheapest food you can find [...] I (also) see that people that have money are more prone to obesity. Before I started working in the school, I thought the opposite. I thought that poor people and people from the country were more prone because they ate things like dolma and stuff, but here I've met kids with so much money that [...] I mean, his father could give him 50 pounds to go and get something on their way to school. And by the way, most of their mothers never prepare or cook food, so the kids could eat completely junk food [...]"– A4

"I mean the poor people you will find them gaining weight to […] their food is the cheap things like macaroni , like rice, like potatoes and French fries… these things are . […] Very cheap and they stop their hunger with it […] and bread too. […] they are also drinking a lot of sugar with tea for example. You will find all the poor people are gaining weight because meat is so expensive and anything else is so expensive. […] with respect to overweight in higher classes, it's because the lady is relaxing herself by getting junk food […] of course junk food has a lot of calories , so the kids get used to junk food and the sweets, and of course all these calories and fats […] what happens is that everything goes down. That's my opinion that's my own point of view for both poor people and rich people."- T3

Despite responses showing a difference in perception of class related obesity, several observations can be made. The majority of respondents identified overweight and obesity as an affliction of the lower SES area, only two respondents perceived it as an affliction of both the lower and higher SES areas. Respondents who thought the lower SES classes were more prone to obesity came from both middle SES areas, but this was also mentioned by a respondent of the low SES area. They mentioned that the lower SES groups buy cheap foods which tend to fill them up (like bread), coupled with apathy towards the quality of the food they eat and the way their bodies look. The low SES area respondent reported that wealthier women are watchful of their weight. This rationale is quite reasonable, given that in the eating patterns section, low SES respondents reported eating whatever is available at home and affordability issues. Moreover, the anthropometric results at the start of this chapter show a higher incidence of overweight and obesity in the low SES areas. One of the low SES respondents even mentioned this point only when she was asked for any other opinions on obesity at the end of the interview, stating:

> "Look, I live according to how much I can afford. If I can get something to eat on my way, I will. If not, I go home immediately."- C4

Those who thought the higher SES classes were more prone to obesity justified their view by saying that high SES groups can afford to eat much more than lower SES groups that resort to buying locally grown legumes and fruits and eating the traditional vegetable based dishes which are healthy.

According to the respondents, these parents seem to be unavailable and money is the substitute for parental presence, which is then invested in fast food (given they are rarely at home and rarely in the kitchen).

Further quantitative data is needed to examine these caregivers' claims, but from all accounts, it seems that overweight and obesity exist in both higher and lower SES levels, even though this study's anthropometric measurements showed a much higher incidence of both in low SES households. This may be characteristic of a phase in a country's nutritional transition process whereby obesity is prevalent in higher SES classes and lower SES classes due to financial means. Whereas lower SES groups buy anything affordable (and sometimes fattening) to satiate their hunger, higher SES groups spend their money on delicacies which consist of mostly junk food – in this case worldwide fast food chains, Egyptian fried food chains and sweet snacks like readymade cakes, waffles and pastries.

5.18 Maternal Perceptions on their Own PA levels and its' importance

Figure 5.6.Maternal perceptions of their own PA

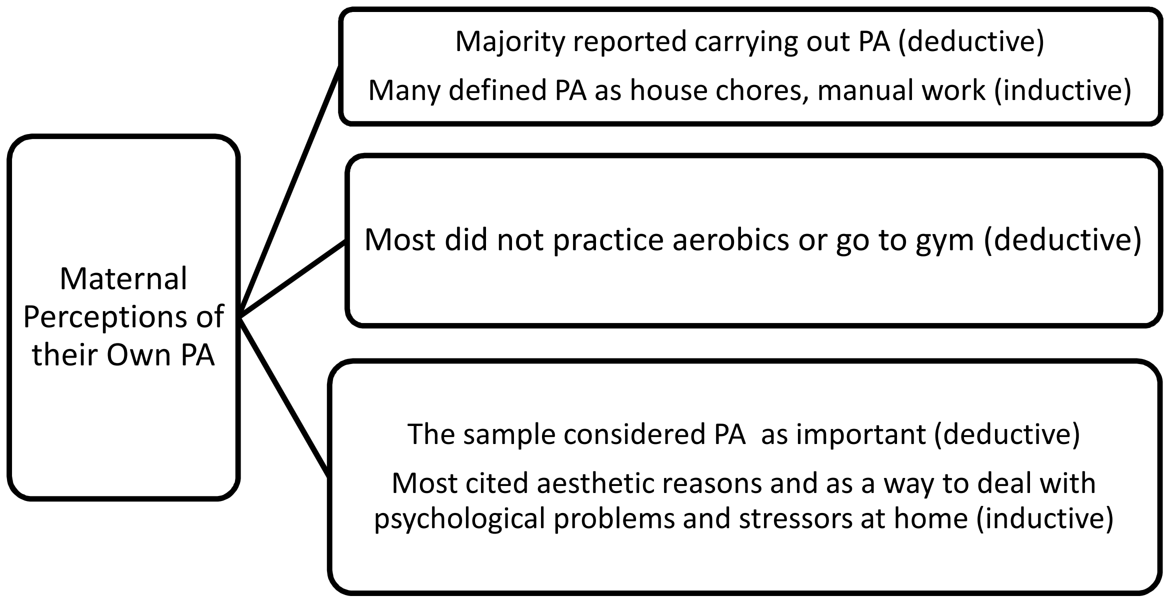


Figure 5.6 describes maternal perceptions on PA. Questions asked included whether mothers practiced some form of PA on a regular basis and whether they frequently engaged in physical exercise (gyms and aerobics). The second part inquired about whether or not mothers perceived PA to be important, and caregivers were asked to elaborate the reasons behind their opinions. The questions relating to their own exercise were both Yes/No responses and were analysed deductively (although an emergent theme was found in responses to the first question, which was an example of inductive analysis). Perceptions about whether PA was important or not was subjected to deductive analysis (Yes/No) but the elaborations to responses were subjected to inductive analysis.

5.18.1 Caregiver's Perception of their own PA

The majority of respondents, regardless of SES area, reported that they engaged in physical exercise. However, they had no time to practice aerobics and gym activities, despite exerting much PA in their everyday lives and chores, as working mothers and household cleaners.

> "Yes, I do all (the work and housework) […] but the aerobics and stuff like that, no. When do I have the time? "– A2

> "Yes, I go to work and I do my job, and that makes me move a lot. But anything else, no. Yes (physical exercise is important), but I have no time to practice physical exercise. That's the problem. "– C6

> "I swear there's just no time. No time at all, no time for me to go to the gym. But anyways, I do physical exercise. I'm a mother, a mother who goes to work and is working at school and who raises three kids and washes and cooks and cleans and buys things from the supermarket. Actually she is doing something. But I can't do sports or aerobics, not at all […] Of course (physical exercise is important), but I do not do any physical fitness and that's the point. "– A4

> "No (she does not do physical exercise), nothing. Where do I go? I have work. I work in the canteen. I carry water boxes and Pepsi boxes, and basically all my work is exercise. I also go and do errands after work, 2 or 3 a day. Can I do anymore activity? "– C4

The responses show that caregivers defined 'physical exercise' as gym related or strenuous activity, as they all mentioned their responsibilities and daily chores as separate to physical exercise. The whole sample interviewed agreed that their own PA was a very important issue to them, mostly for aesthetic (weight) and psychological reasons.

> "Yes of course, it's very important for people psychologically. At least if I'd have done any physical exercise, my body wouldn't be this fat."– C7

“It’s important to me […] Because of my appearance”– T4

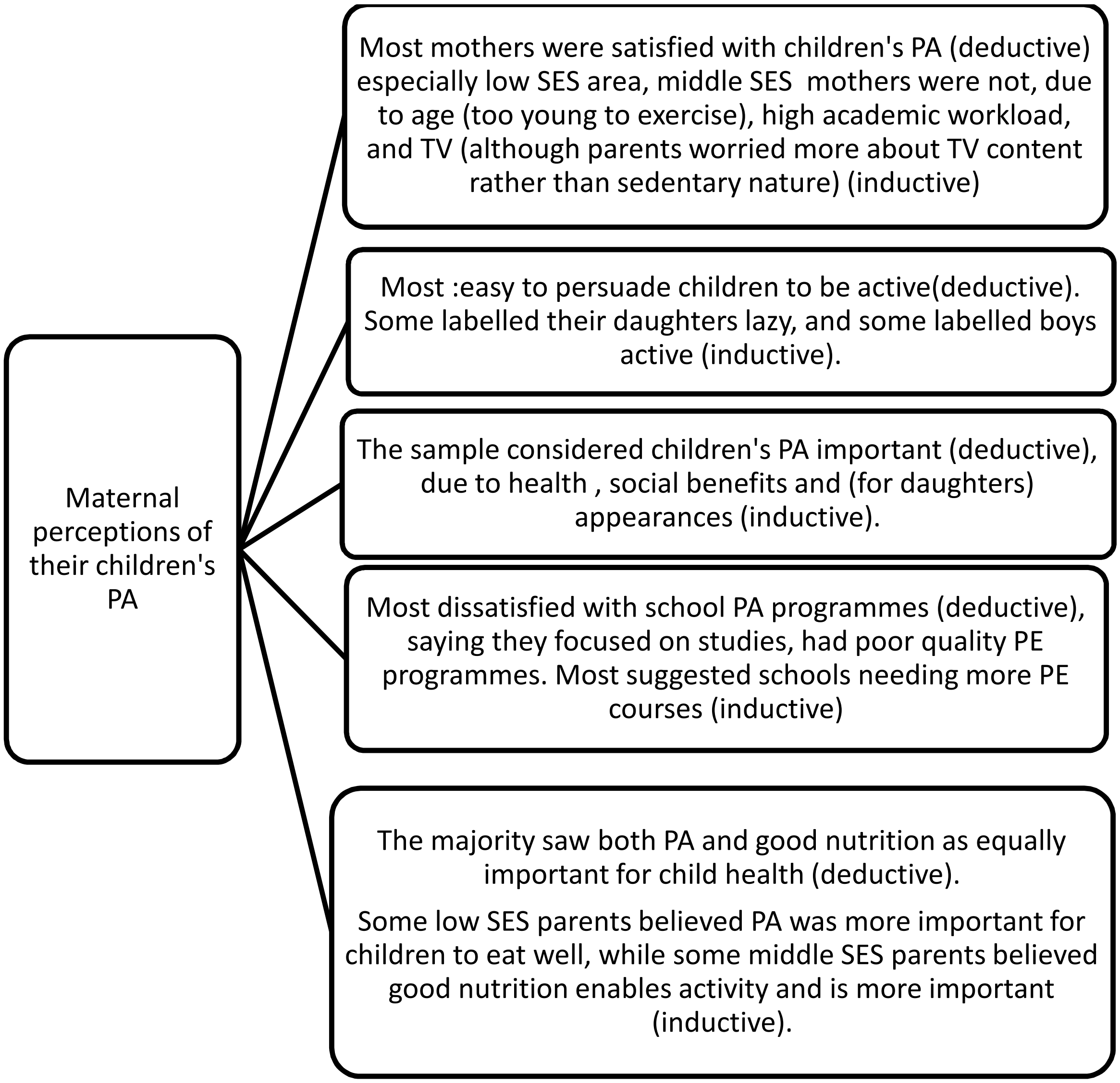
“It is (important) […] (I’d want to exercise). Because I have problems in my home [laughs]”- A1

“It’s important [...] even though I do not do it [...] because I know I will lose weight if I did it. I know that I will lose weight. Like in Ramadan, I lessen the amount of food I eat and I still exert and effort so I lose weight. But when it’s over I gain weight again.”- A4

“Yes […] Because I’m active […] if I do not do activity you know I get (pulls ‘crazy’ gesture) […] [laughs].”- A2

5.19 Maternal Perceptions of Children's PA

Figure 5.7. Maternal perceptions of their children's PA



This section examines maternal satisfaction with their children's PA (Fig. 5.7), (and reasons), as well as the ease of their persuading their children to be active, their perception of the importance of children's PA in general, their satisfaction with their children's school's PE programmes, and whether they thought PA was more important for the child's health or vice versa. All initial questions were Yes/No responses, and the last question involved which they thought was more important, which led to deductive analysis. However, mothers were asked to elaborate/cite the reasons behind their perceptions, and SES patterns were also investigated, which employed inductive analysis.

Around three quarters of the sample were satisfied with their children's amount of PA, which they then went on to describe (see section 5.14). The few that voiced their dissatisfaction were mainly from the middle SES areas. When asked why they felt their children did not exercise enough, they reported their children's academic workload, academic pursuits, and age as a cause.

> "No […] she's not doing any activity now […] I'm trying to develop her mind […] I'm concentrating on developing her mind more than the physical aspect […] I know this is wrong I know."- T3

> "No […] my son is too young, he's only two. Not much to be done. My daughter, no, no."– T2

> "She's got alot of studies, but I'd like her to have more exercise time. […] You know time here can be very tight with all the studying and there isn't […] say she finishes school around 3 - 4 she gets home, she has lunch at 4. If she has homework, she finishes it in an hour or an hour and a half, and she always has exams. So if she has training, she will come home tired and she'll eat and sleep, She doesn't have any time to play. But it's possible in the weekend or holidays. The problem is though that during holidays you want to travel and to go places, get it? So it's enough, it's enough that she plays, but it should be more than that."- T4

> "No, she doesn't exercise at school at all. She studies, God help her in her studies." – C4

Despite their dissatisfaction with their children's exercise, they seemed to place academic achievements above PA in terms of priorities and importance. This is clear in the quotes above, where one respondent's focus shifted from the exercise to the studying and wishing her daughter well in the studies and with another caregiver who admitted she was hindering her daughter's PA by stressing her academic success.

5.19.1 Respondents' View on the Importance of their Children's PA

All parents said that their child's PA was important to them. When asked why, their responses were mainly for the health and social benefits that resulted from an active life. Mothers mentioned they wanted their children to be fit, and to be able to form healthy social relationships with others through sports and teamwork etc.

> "I want them to be the best people, so I think that a physical life would help them [...] to get engaged in life."- T6

> "(It is important) So that their weight doesn't impact them… because excess weight leads to all kinds of problems. Exercise burns sugar and fat and consequently there won't be any problems."- C6

> "Yes, it's very important because it will make him healthier. He will have less illness and more good health and more energy."- T5

An interesting observation was made when examining caregivers' responses. None of them related their child's PA to 'obesity', but always to 'health'. This may indicate that they do not correlate obesity with PA.

Physical appearance was mentioned rarely, only by mothers who had daughters; the mothers who said this reported this as being the only reason their daughters should engage in exercise. One mother wanted her daughter to be pretty while another mother, who responded that her own physical exercise was important to her because of her appearance, attributed the importance of her daughter's exercise to the same reason.

> "And pretty and upbeat, yes. I want her to be pretty."- C4

> "(I think my daughter's physical exercise is important) Also because of appearance."- T4

This once again shows that for women, social pressure to be 'pretty' and 'desirable' outweigh the health and social benefits of physical exercise. Moreover, gender roles were also incorporated into the response of a couple of respondents who believed – and generalised - that girls prefer SA and academic work to boys and were thus more concerned about their girls gaining weight due to their natural state of disliking PA.

> “I think that boys move more, they are more active, more than girls. Boys do not like studying as much as girls. Girls love to study quite a lot, unlike boys. Just that.“– A1

> “The boy will do physical activity anyways, but with a girl, obesity will ruin her looks, and also she won’t be able to exercise as much. It will ruin the girl’s appearance.”- A3

Therefore, it is obvious that parents are quite concerned about their children’s PA. Although mothers are all concerned about their children’s health regardless of gender, it is interesting how their priorities change and attractiveness is mentioned where daughters are concerned.

5.19.2 Whether Good nutrition or physical exercise is more important for their children

When mothers were asked whether they believed that good food or exercise were more important to their child’s health, eight of them thought that a balance of both is important, some parents stating that good food and exercise “complete each other”. Half of mothers who believed this lived in low SES areas, the rest were divided between lower middle and higher middle SES area dwellers.

> “Both, together. Because to do sports, it’s an effort so they need to have food. Exercise takes up energy, you see I know these things. Children need to have good food to make up for the exercise.“- C1

> “Good food and good exercise. They go together. They complete each other”- C3

> “Both […] obviously if they sit, they’ll eat a lot and they’ll be fat.”– A2

The rest of the respondents regarded one or the other as more important to their child’s health. A very interesting observation is that exercise was reported as being more important more often among low SES residents.

> “No not food. She should be healthy and have a healthy life and mind, but not necessarily food.”- C4

> “When he does good exercise, he eats well. […] Yes (I think exercise is more important).”- C5

> “Physical activity! […] Because no matter what they eat, they will burn the calories in the physical exercise.”- T6

Although a number of respondents thought exercise was more important, it’s interesting that food was incorporated into the response of one caregiver as the goal of physical exercise. This may imply that food is the important factor.

Food was considered more important among the lower middle and higher middle SES areas. Many caregivers believed that feeding the child more would enable him/her to exercise more frequently and carry out greater levels of PA.

> “I think that if she eats well [...] I mean, if she practises sport I want her to practise it, to move alot and such. But she does need to eat so that she gets energy. I feel that her lack of exercise is because of her lack of food.”- A3

> “He must eat something good and be healthy to do exercise [...] and at the same time he can’t just eat and not exercise, and he definitely can’t be exercising without having a good meal.”- T5

This section once again provided an interesting revelation regarding perceptions of food and physical exercise with respect to SES area. Food seemed to be more prominent and important in the responses of middle SES households, while the importance of either exercise or a combination of food and exercise was the dominant among low SES area households. Low SES classes might value exercise more than food, as exercise and physical health is a requirement in their daily jobs. They possibly believe their children will end up in a vocation similar to theirs that requires physical stamina. Therefore, there might be a financial factor in play here. Higher SES areas focused on food as being more important, as physical exercise in their daily lives and jobs may not play as vital a role in both their and their children's lives. Even with respect to children's daily activities, children of low SES areas needed to exercise to walk to school, whereas middle SES children used transport or the family car. In addition, children of higher SES areas are more accustomed to practising PA in leisure time activities – frequently visiting the sporting club or park.

5.19.3 Motivating Their Children to Exercise

Most of the caregivers interviewed found it easy to persuade their children to be physically active. These parents mentioned that their children were quite physically active regardless of their motivating the child and consequently PA and play is natural to them. Parents also tried to balance their child's life between PA and their preferred sedentary activities.

> "It depends on his mood. A lot of times, it's quite easy, but if there's something else to do he will say no. But a lot of times, it's very easy."- Age 39, higher middle SES area

> "Sometimes if he has time to play with something like Playstation or Wii, he wants to stay at home, but now we schedule it. Sometimes he has swimming and sometimes he plays with his video games … he sees his friends. We schedule it."- A1

> "I have to pressure my older son to move but my younger son is naturally active."- T1

However, parents of daughters (who were labeled lazy) responded:

> "She spends a lot of time (watching TV) during the day … maybe after studying … if she hasn't got anything to study … She's just drawing or reading or watching TV or playing computer. That's just about her day."- T3

> "Sometimes she is lazy"- C1

Examining parental concerns with children’s sedentary behaviour (television and computer engagement) revealed that many parents were concerned. Some restricted the use of television.

> “All throughout the week, we do not watch TV at all. Over the weekend, it’s Thursday night, Friday night for about an hour […] that’s it.”- T2

> “When he’s on the computer, I get him programmes from the net and he decides what to watch while I’m there.”- C3

> “No, I do not like TV […] nor do I like the internet, actually. It’s under my supervision, I keep going back and forth to see what she’s doing. Nothing else to say.”- T2

However, investigation into the reasons behind their concern showed that parents, particularly low SES area residents, were concerned about other aspects of the television other than the frequency and the potential effect on PA. Their biggest concern was TV and internet content, and they consequently monitored their children’s viewing activity.

> “Yes (I am concerned). Especially since he can learn things that I do not want him to learn”- C5

> “I get worried about TV, because he might learn violence from cartoons. Because everybody follows these things by example.”- C3

An important SES difference is observed in the previous section; more parents of middle SES households (both lower and higher) reported trying to persuade their children to play actively. They reported their children watching more hours of television and playing on various video game consoles available at home. These items are available in abundance in households that can afford them, thus greater wealth may lead the child to practise greater SA like videogames. Moreover, if this is applied to the neighbourhoods in general, most probably children from middle SES areas will engage more in home activities (TV, videogames) than their low SES counterparts, who would be more likely to play outdoors with other children from the area.

5.19.4 Opinions on School PA Programmes

Since school makes up a large part of a child's life, caregivers were asked whether they thought their children's schools provided enough opportunities and support for physical exercise. Parents living in high SES areas sent their children to private education schools (usually international schools) while those in the lower SES areas sent their children to affordable government funded schools (which are usually very close to their homes). Most parents were disappointed by their child's school in terms of PA, as many reported that schools did not do enough. This was an opinion shared across all SES areas, and explanations revealed that the majority of their children's schools place a much higher emphasis (in some cases all emphasis) on academic achievement, leaving little or no time or effort to develop PA schemes or programmes.

> "No, No. Government schools are this way. They are only about studying. Sports mean nothing to them."- C1

> "I think not. […] The problem is people cannot do more than this in schools now. […] with respect to schools today, PE has become unimportant […] you know the PE classes, kids love it, the students love it, but with respect to the parent, it's unimportant. The most important thing to them is the education itself." – T4

> "Of course not! (My kids)'re here in the school by the way […] Because I've seen the PE teachers here. But (in my own high school- abroad), our fitness and PE used to be different. We used to have teams. Here, the PE is funny. It's funny ! I've seen the PE teachers in the PE class, and … Nothing! Where are the relay races? Where are the track and field? Where is the jump? Where is the volleyball court? Where is […] no it's different. We were taught a lot. I do not know. I do not feel that this is PE over here in the school. And there was EMAC (sports tournament). This doesn't exist in Egypt. And teams and after-school. Where is all that? These things do not exist here. Junior varsity and varsity, things like that. I really miss […] this kinda stuff doesn't exist here"– T2

Even though the schools attended by middle SES areas children provided physical education classes, as opposed to some of the government schools who did not even have a physical exercise programme, caregivers of high SES children believed that the emphasis on PA was still way too low. They mentioned that PE classes were very few and numerous respondents suggested providing a greater number of classes as a main suggestion to improve PA.

> "For example, they should increase the time spent doing activity, say now they have once a week exercise and break time. They should do twice a week and breaktime, thus they'll increase it a little bit."- T5

> "[…] uhm maybe more games […] but there should be a certain day for games even between teachers and students. This should be five days though, Even the students are very active they must use this energy towards something useful."- T3

This section shows that regardless of the type of school attended, children did not get adequate opportunities to practise physical exercise in Egyptian schools. It is true that the higher the school fees in private and international schools, the better the chances of having PA facilities and sport programmes offered. This is however offset by the prevalent cultural emphasis on studies and academic success, which was expressed throughout the interviews. This does highlight an important SES difference, namely the greater opportunities for PA provided to children of middle (and high) SES areas.

5.20 Caregivers' Resource Usage to Learn about Health

Respondents were asked whether or not they used any resource (books, magazines, television) to learn about childhood health to improve their own child's life and health. Most of the respondents actively searched for resources related to childhood health.

> "Yes of course. The internet. Anything. Usually my son is the one who gets me all the information. I do not sit down on the computer, he gets me everything from the internet"- C1

"I usually read about food. What we're supposed to and not supposed to eat, the quantities. […] I'll just look for the books, or read the ones I'm given."- C3

"I go to Google and I type the age, from this age to this age, or any problem that faces me. All I do is go on the internet and research it on google, try to read anything about it."- A1

"Books. What's the name of that child book? […] hmmm […] it's quite famous […] I can't remember the name at the moment."- A2

"Websites […] I love to know everything with reading so maybe not books […] I'm more interested in searching the internet to find more […] to be updated I mean. […] Just searching on google to read the title I want or the article I want […] to read just the information I want."- T3

Among caregivers who researched childhood health to aid their parenting, the two most popular options were the internet and books. The internet however was the most popular option, as several caregivers reported using search a variety of web pages, including medical pages, specialised sites and online search engines to look up particular topics. Respondents from higher SES neighbourhoods were more likely to resort to printed sources like books and magazines, while lower SES area respondents were more likely to use online sources. A few caregivers reported using local magazines about childhood health, or resorted to newspaper sections on childhood health issues.

"Yes. There's a small magazine called the Health of […] I do not remember, something and mothers, something like that. I used to get that alot and read it. 'The Health of Children'. Something like that. It comes out once a month."- T4

"Yeah. The newspaper. The Al Ahram newspaper. They have a section about nutrition for little kids [...] and what type of food to give them each day [...] and how it helps them increase their intelligence and so on."– T6

Six respondents did not actively search for resources, due to poor literacy, or lack of time, although one reported that her child goes on the internet to search these resources.

"Me, no. but my kids go on these sites."– C2

Four of the six respondents who did not actively search for information hailed from the low SES area. Caregivers living in the low SES area did not use any resources since some were illiterate – they required the researcher to explain the interview before hand and signed the consent sheet with an X - while the two respondents living in the middle SES areas reported having no time to research childhood health. Low SES respondents replied that their children tend to use the internet to find articles on health, but reported that they could not do so themselves.

Therefore, higher SES respondents preferred printed sources of childhood health (probably due to the fact that most were teachers and maybe regarded printed sources as more reliable) whereas lower SES respondents preferred the internet, which is available to all. Despite this, the internet remains the most popular option among the entire sample. Illiteracy, certainly an SES issue due to lack of education (only the cleaners from the low SES areas reported this) is an obstacle to greater knowledge and understanding of childhood health.

5.21 Summary and discussion of Qualitative Findings and Emergent Themes

5.21.1 Maternal Perceptions of Obesity and PA in Egypt

Most respondents correctly identified their overweight/obesity, but a few overestimated their weight (they had healthy weights) and lived in middle SES areas. Most caregivers were concerned about their own weight but mainly for external pressure, duties, and expectations as a wife (particularly low SES caregivers) and aesthetics (particularly middle SES area caregivers). The entire sample reported obesity as an adult woman's issue in Egypt. Most identified female relatives as overweight/obese and cited numerous causes to women's obesity, mainly dietary intake and also lack of exercise coupled with their maternal and career duties. Caregivers did not perceive their children to be overweight/obese and this was regardless of caregiver weight status. Most caregivers did not perceive obesity as a childhood issue in Egypt. Few caregivers reported infancy and late childhood as having a high prevalence of overweight in children. Childhood obesity was mainly attributed to dietary factors, particularly the lack of an organised eating schedule and the over-feeding of children. Caregivers were concerned about their child's weight gain, especially daughters, as overweight would reduce chances of marriage and affect aesthetics. Caregivers were divided in terms of opinion on which socio-economic category was prone to obesity. Some cited that upper SES households were prone due to abundant food and junk food, while others claimed low SES households were prone due to eating cheap and filling food.

Many caregivers believed both food and exercise were equally important to children's health, complementing one another. Low SES households were more likely to cite PA as the most important factor, while middle SES households were more likely to cite good nutrition as more important. Both middle and low SES caregivers believed that eating well was an important factor, which may indicate dietary factors are regarded highly in Egyptian culture. Most caregivers stated that their child's PA was important to them, and the reasons included health benefits, social benefits and aesthetics (particularly for daughters). Most caregivers were satisfied with their children's levels of PA, but some middle SES caregivers reported not being satisfied. Many caregivers believed their children's schools did not promote PA enough, focusing instead on academic achievement - some reported their children's schools having no PE programmes.

5.21.2 Egyptian children's diet and PA experiences and differences between SES areas

Interviews revealed that Egyptian children and families eat three meals a day. Breakfasts mainly consisted of bread (white, baladi, buksumat) and cheese, milk and tea with sugar regardless of SES area. Low SES households ate cheaper, filling breakfasts such as foul and ta'ameya, and middle SES households ate eggs, chocolate spread, cakes, and sweets. Egyptian lunches are mainly meat (chicken or beef), rice (alone or stuffed in peppers/dolma) and local vegetable dishes, with fruit as dessert. Salty food (mekhalel – pickles) was popular particularly in lower SES households. Low SES areas used cheap ghee for cooking, while middle SES households used corn/sunflower oil. Low SES areas reported sometimes eating whatever was available at home, while middle SES households ate unhealthy desserts (chocolate, sweets and crisps). Dinners were generally smaller than previous meals, and low SES area caregivers reported their families eating whatever was left over from lunch. Most households reported eating yogurt, and low SES households reported eating cheap, unhealthy and filling feteer or halawa, while middle SES households reported eating cakes or pizza. Children were the likeliest family members to have snacks, (chocolate and crisps). Lower middle SES children mostly ate fruit or fruit juice as snacks.

5.21.3 Emergent themes: Socio-economic Differences in PA and Food Choice

Socio-economic status and affordability were a major recurring theme in the analysis. Firstly, the anthropometric measurements taken prior to the interviews found that overweight and obesity were characteristic of all respondents from low SES areas, and the prevalence of both was less in higher SES status respondents. The home environment may very well be a factor behind this, given the descriptions of the low SES areas and satellite shantytowns characteristic of where they live – basic, random and without planning (Sims, Sejoume, & El Shorbagi, 2003; Denis, 2006). Affordability was also a factor leading to SES differences. Affordability affected both the dietary content and eating patterns of a household, as well as PA levels. This may indicate that the economic gradient noticed in global studies (Travers, Cogdon, & McDonald, 1997; Drewnowski & Darmon, 2005; Power, 2005) may also exist in Egypt whereby the higher SES groups can afford to eat more healthily. Moreover, women in Egyptian society may be adhering to Bourdieu's 'habitus' concept (refer to section 2.6), which takes into consideration cultural, economic and social variables as well as education feeding into awareness - some cleaners from the low SES area were illiterate (Bourdieu, 1985; Power, 1999; McLaren & Kuh, 2004; McLaren, 2007). And as the previously cited studies have demonstrated, a correlation between levels of employment, educational attainment and neighbourhood area level may exist among the women interviewed, but more respondents were needed to investigate the statistical significance of this.

When looking at PA in relation to SES, the proximity of the local government schools allowed children of low SES areas to walk or cycle to them, as parents could not afford to send them to distant - more expensive - schools. Children of middle SES respondents used transportation to get to schools which were not as close to their homes as schools in low SES areas. With regards to PA activities in schools, the low SES government schools failed to provide any PA programmes or extra-curricular sport activities for the children, instead focusing only on academic curricula. Schools that were attended by middle class SES children, despite also focusing heavily on academic curricula, provided basic PA activities and sometimes extra-curricular activities but did not focus enough on them. In a sense here, Bourdieu's (1985) 'habitus' may also be a factor, whereby people are not only embodying their social structure, but also using it to influence their children. It seems that schools, most specifically government schools catering to the low SES area, place educational curricula as their sole aim. This might be due to the belief that academic excellence might lead to these children attaining better jobs and ultimately enhancing their SES. These schools may consequently deem physical exercise and sports unimportant. Schools of higher SES areas, though focusing mainly on academic excellence, provide PA opportunities to add allure to the more educated, wealthier parents as an extra benefit for their child.

In terms of PA in or around the house, children of low SES area respondents seemed to play outdoors, as they had less access to SA like videogames and television. However, they were not exposed to outdoor public areas as much as middle SES children. Lower SES families are less often members of sporting clubs or gyms, once again due to affordability, and this presents yet another obstacle to healthy living and maintenance of a healthy weight status. Moreover, financial constraints reported by low SES parents placed pressure on them to work to support their families, which gave them little time to engage in PA alone or with their families and children.

In terms of facilities and equipment access, it seems that the higher the SES area, the more available the PA equipment and access to it (extra-curricular school activities, parks, sporting clubs). However, opportunities – albeit less in quality - exist for low SES areas as well (proximity of schools, unavailability of sedentary media). Despite this, low SES area children are still at more of a disadvantage given there exists a lack of PA opportunities for their mothers (apart from their jobs as cleaners), which could positively impact their PA. All low SES respondents in these interviews were overweight or obese despite their physically demanding jobs. Their overweight and obesity may play into the parental influences and knowledge and attitudes in Gattshall's model (refer to section 2.8.2). Bourdieu's (1985) 'habitus' once again comes into play here, as attitudes are affected by knowledge, and some respondents from the lower SES areas were illiterate, which greatly hinders their access to information regarding their own and their children's health. Lower SES parents also seemed to be less concerned about their child's weight gain than parents of higher SES areas, which may indicate that they may be preoccupied with other matters (financial, survival, satiating hunger). Children, seeing their parents' appearance and attitudes, may be influenced, and research continually demonstrates that children of overweight and obese parents are at a higher risk of overweight/obesity than those with healthy weight parents (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997; Strauss & Knight, 1999; Foresight, 2007; Davis, McGonagle, Schonei, & Stafford, 2008).

Additionally, affordability played a part in terms of food quality and choice, and also in seeking solutions to obesity. In the case of being overweight or obese, financial obstacles prevent people from seeking advice of dieticians. The quality and amount of food consumed depended mainly on affordability – lower SES areas opted for cheaper options. In an Egyptian setting, this may increase the consumption of cheap locally grown healthy food – legumes and vegetables – or unhealthier options – overconsumption of bread, local ghee etc. Although high SES classes may be prone to overweight or obesity through greater financial freedom to indulge in high energy foods and (in children) due to the absence of parents in demanding high paying careers, their wealth allows them to take care of themselves by joining sporting clubs, attending schools which offer PE classes and extra-curricular activities, and also seeking professional help in the event of overweight and obesity. This once again shows how people embody their social structures – in this case using their money to tackle their obesity by means of diets. People in middle SES areas also tend to eat unhealthy outdoor food and unhealthier items that are not local (cakes, crepes, waffles, fast food), a Westernised middle class emulating international trends. Illiteracy also plays into social structures here – illiterate low SES respondents have no means of researching what to eat and what not to eat, and therefore rely on buying based on two factors: affordability and achieving satiety.

5.21.4 Emerging Themes: Food Habits & Patterns

Food quality and eating habits, in addition to being the focus of the first phase of the interview, emerged as a strong recurring theme among most caregivers. The first dietary habits section revealed the whole sample had heavy breakfasts and lunches, and had lighter dinners (if any). The density of breakfasts and lunches, and the frequent availability of numerous dishes on the table may be a hindrance in encouraging families and children to over-indulge in eating. Moreover, the interviews showed consumption of certain kinds of unhealthy local foods – particularly salted (eg. mekhalel pickles) and dense food items (eg. foods prepared with ghee), particularly among lower SES areas. The food items mentioned in the interviews coincided with the few studies that investigated the Egyptian diet (Galal, 2002; Hassan-Wassef, 2004). Like the papers, the traditional diet – the vegetable dishes that are central to Egyptian culture – remains important particularly during lunch. Also, as mentioned in the previous papers, the increase in the uptake of food groups such as red meat, poultry and dairy products is demonstrated from responses – poultry & meat were popular food items. Also, macaroni, rice, white bread and other imported foods and desserts (cakes, non-Egyptian sweets) are consumed in high numbers as described in Hassan-Wassef's (2004) paper.

Despite engaging in unhealthy food practices, the sample blamed their and their children's eating habits (quality and schedule) as well as parents' overfeeding their children for the rise of overweight and obesity prevalence in Egypt, much more so than (lack of) PA. Since family cohesion is a norm in Egyptian culture regardless of SES (Aldinger & Bauernfeind, 2001), this will greatly expose the reference children to certain types of food, and as studies before have demonstrated, children grow accustomed to eating what their parents like to eat, and what is available at home (Patrick & Nicklas, 2005; Birch, 2006). Children's feeding is also influenced by the beliefs and attitudes of parents (Lindsay, Sussner, Kim, & Gortmaker, 2006; Jurkowski, et al., 2013). The belief that eating well - in the Egyptian sense, this more often translates to quantity than quality - is important leads to overfeeding which may eventually lead to obesity.

5.21.5 Emergent Themes: Age & Gender Specific Issues

Age and gender specific factors and perceptions of obesity were evident throughout the interviews. Most caregivers viewed obesity as an adult problem, namely an adult woman's problem. Some respondents thought that adult men were also prone, and numerous respondents stated that marriage (and subsequent pregnancy in women's case) is the life event at which obesity becomes prevalent. Most women interviewed perceived themselves and other female members of the family to be obese, even though some of them exhibited healthy BMIs. They rarely saw their husbands or male relatives as overweight and this may be indicative of a gender bias in obesity perception. Moreover, the healthy BMI women who perceived themselves as overweight were middle SES mothers - this again displays Bourdieu's (1985) 'habitus' concept in the sense that middle SES women see increasing thinness as the healthy weight.

Marriage was revealed to not only be the point at which overweight and obesity prevalence rises, but was shown to be the cause for the high level of concern among parents regarding their daughters' gaining weight. Marriage is an important aspect of Egyptian society, and while the demands on the groom are financial stability, the demands on the bride are primarily her physical attributes. Girls of healthy weight are considered more attractive than overweight or obese ones, and have a higher chance of getting engaged and married. While this might pressure girls to live healthier lifestyles, albeit for reasons other than being healthy, there is a common notion in Egypt that girls prefer sedentary activities. This is also enhanced by women's/girls' status in society whereby PA outside the household may be perceived negatively. The interviews revealed that more sons practised sports outside the home, and that daughters were sedentary and 'lazy', perhaps an internalisation of society's gender roles. Married women are disadvantaged in Egyptian society due to the responsibilities they have as a caregiver and mother regardless of their working status, as discussed in Aldinger & Bauernfield's (2001) model. This consequently takes up most of their time, preventing them from engaging in PA or even researching health issues. These restrictions and duties may be an important factor behind the recorded high prevalence of overweight and obesity among Egyptian women in particular (El-Zanaty & Way, 2009; WHO, 2010). Once again, 'habitus' comes into play when gender is concerned. The interviews showed that despite the negative consequences of harsh demands and restrictions, Egyptian women truly embody their roles in society as wives, mothers and running the household. Although this may help them till marriage in keeping them at a healthy weight in order to find a husband, they seem to lose weight control when they get married. This may be a negative influence on daughters who may see their mothers' weight as the healthy weight of a married woman.

Caregivers believed that obesity was not a childhood issue in Egypt, and most did not consider their children to be overweight or obese. Some caregivers also mentioned that adults view plump children as healthy, and this may make matters worse in recognising and dealing with childhood obesity. Parents' misperception of their children's overweight and obesity has been documented in several studies (Etelson, Brand, Patrick, & Shirali, 2003; Walling, 2008; Aljunaibi, Abdulle, & Nagelkerke, 2013).

These age and gender perceptions of respondents play into attitudes and beliefs within the home environment in Gattshall et al.'s (2008) model. When parents fail to perceive and recognise their child's obesity, this has an impact on their own obesity. Moreover, their perception of obesity as an adult disease may influence the child's weight as an adult. With respect to unmarried girls, the pressure on them to be thin may be a blessing in terms of them watching their weight by controlling their eating, but this pressure disappears as soon as they are wed, as the main goal behind thinness has been achieved. This may also be disadvantageous for young boys who have less pressure to conform to a body ideal, and who may thus be overweight and obese. However, boys in Egyptian society are much freer to practise PA. The belief that girls are sedentary and boys are active, coupled with the restrictions on women's engagement in PA activities and other activities outside the home, may put young girls at a disadvantage. On one side, they are pressured to be thin, while on the other hand, they are denied access to facilities that their male siblings/counterparts are granted.

5.21.6 Emergent Themes: Academic Pursuits over PA

Finally, in schools and sometimes at home, academic pursuits seem to be more important than PA. Dissatisfaction with schools and their PA programmes (if any) seemed to be the unanimous view of the sample. Schools were reported to focus mainly on education and academic achievement, leaving little or no time for PA. Some schools offered PA programmes and extra-curricular sports and teams, but were also deemed unsatisfactory by parents due to lack of equipment and investment (compared to academic courses and curricula). Most parents called for an increase in PE classes and greater involvement in the child's physical health. Although parents were generally critical of their child's schools inadequacy relating to PA programmes in the interviews, some parents revealed that they placed academic achievement above PA with respect to their own children. This may hinder children's opportunities for active play and physical health and development in these very important childhood years. Both school and parents influence PA in terms of both access to equipment (limited or non-existent in many schools) and parental influences (stressing academic achievement) which may both adversely affect the reference child's weight. The stress on academic importance is, in itself, an example of 'habitus' of the Egyptian cultural context. Most of the interviewed mothers, some of whom are teachers themselves, stressed the importance of grades and academia. Children, who are quite impressionable, may most likely grow up thinking that academic achievement is their primary goal, while PA is considered unimportant or trivial. Speaking from personal experience growing up as an Egyptian student - albeit from an educated middle class background - this perception was most certainly the case, particularly from late childhood onwards.

5.22 Conclusions

This qualitative study revealed that the majority of caregivers perceived themselves to be overweight or obese. Most correctly identified their overweight/obesity, and the few middle SES mothers who actually had healthy weights overestimated their weight. Most were concerned about their own weight due to external pressure and duties (particularly low SES caregivers) and appearance (particularly middle SES area caregivers). The entire sample identified obesity as an adult woman's issue in Egypt, mainly identifying female relatives as overweight/obese and citing diet, lack of exercise, maternal and career duties as reasons. The sample perceive their children as having healthy weight, and most did not perceive obesity as a childhood issue in Egypt. Caregivers attributed childhood obesity to diet, namely lack of eating schedules and over-feeding. Caregivers were concerned about their daughters gaining weight as it reduced chances of marriage and aesthetics. Some caregivers believed that upper SES groups, with abundant (junk) food were prone to obesity, while others believed low SES households were susceptible due to eating cheap, filling and available food. Most caregivers believed diet and PA were equally important to children's health. Low SES households suggested PA was more important, while middle SES households cited good nutrition. Both, however, emphasised eating well, revealing that dietary factors are first and foremost in Egypt. Most cited the importance of their child's PA for health, social benefits and aesthetics (especially for girls), and most were satisfied with their children's PA. Some middle SES caregivers were not satisfied and reported that their children's schools did not do enough to promote PA but focused on academic achievement primarily.

Egyptian children regularly ate three meals a day. Breakfast (regardless of SES) mainly consisted of bread, cheese, milk and tea with sugar. Low SES households ate cheaper more filling breakfasts (foul, ta'ameya) and middle SES households ate eggs, and sometimes chocolate spread, cakes, and sweets. Egyptian lunches consisted of meat (chicken/beef), rice and local vegetable dishes, eating fruit as dessert. Salty food (mekhalel) was consumed often particularly in lower SES households. Middle SES households indulged in unhealthy desserts such as chocolate, sweets and crisps. Low SES households cooked with cheap ghee, middle

SES households opted for corn/sunflower oil. Dinners were smaller, low SES areas eating whatever was left over from lunch. Most households (regardless of SES) reported eating yogurt as an option. Low SES households ate cheap, satiating unhealthy feteer or halawa, while middle SES households reported eating cake or pizza. Children were the family members who snacked the most, eating chocolate and crisps (higher middle SES) and fruit or fruit juice (low and lower middle SES). With respect to PA, most children played football in the neighbourhood or at school. Low SES and lower middle SES children rarely engaged in school extra-curricular activities. Children from the three SES areas practised PA, but these differed within the SES area in question. All children engaged in active play and helped with housework. Higher middle SES area children were exposed to PA encouraging environments through family activities - frequent park and sporting club visits - but did not walk or cycle to their schools which were far away. Lower SES area children, despite little PA encouraging environments, walked to their nearby local schools and played in the neighbourhood.

The next chapter is the study's discussion, which summarises and analyses the study's findings. Following this is the last chapter, which presents the study's conclusions and offers recommendations for future research and policy in Egypt.

Chapter 6 Discussion

6.1 Chapter Overview

This chapter is a reflection on both quantitative and qualitative results of this study. The discussion analyses and explains the findings of this pilot study, adding to the limited body of knowledge concerning home environment's impact on childhood obesity in Egypt. This study was based on the socio-ecological model (SEM) of obesity, namely the basis for this study's plan, Gattshall et al.'s (2008) model of physical activity (PA) and food home environment Influences on childhood weight. The discussion section is framed around Gattshall's model. It briefly recaps the study's four main questions and answers each briefly, followed by an in-depth discussion of the food and PA home environment based on the SEM/Gattshall model, discussing the findings of each and complementing the findings of both qualitative and quantitative phases. Next is a section on caregiver weight, smoking and sleep, followed by an in-depth discussion of maternal perceptions of obesity, children's diet and PA. Finally, the discussion then presents the limitations of the current study, and finally offers resulting recommendations for both future research and for future policy and practice efforts at tackling obesity in an Egyptian context.

6.2 Key findings

Descriptive data revealed that most reference children (45.7%, n = 96) were 2–5 years old, 20% (n = 42) were 6–8 years old and 34.3% (n = 72) were 9–12 years old. Moreover, 52.9% (n = 111) were girls and 47.1% (n = 99) were boys. Anthropometric data (209 children in total) found 37.8% of reference children (n = 79) to have healthy/thin BMI Z-scores (under 1 SD), 9.6% to be underweight (n = 18), 32.1% (n = 67) to be overweight, and 21.5% (n = 45) to be obese. WtHR data revealed that 50.7% (n = 106) had healthy WtHRs and 49.3% (n = 103) had at risk WtHRs. While BMI Z-scores did not differ significantly between age and gender groups, WtHR scores differed significantly in both, where older age groups ($p<0.01$)

and boys ($p< 0.05$) had significantly lower WtHRs. Data revealed that the majority of children met/exceeded the recommended levels of moderate/vigorous activity (60 minutes a day) on both weekdays (80.8% of the sample, n = 168) and weekends (81.3% of the sample, n = 169). If broken down by gender, 82.7% of boys and 78.4% of girls met PA recommendations.

1. ***Are there significant relationships between various home environment aspects and childhood overweight/obesity in Cairo, Egypt?***

Within the physical home food environment, unhealthy food accessibility ($p < 0.01$) were significant negative predictors on WtHR. High accessibility to unhealthy food items reduced child WtHR. None of the food social environment scores had a significant association with childhood weight after adjusting for age, gender and SES area.

With respect to the PA home environment, higher parental PA modelling significantly increased children's BMI Z-scores ($p < 0.05$). Practicing moderate media rewards were associated with lower child WtHRs (both $p < 0.01$). None of the PA physical environment scores were significantly correlated with childhood BMI Z-scores or with WtHR. Caregiver weight, smoking scores and sleep durations also showed no significant correlations with child BMI Z-score or with WtHR.

Data revealed that 80.8% (n = 168) of children met the recommended moderate/vigorous PA levels (60 minutes a day) on weekdays, while 81.3% (n = 169) met the recommended PA levels on weekends. Weekend moderate/vigorous PA levels were found to be significantly associated with children's BMI Z-scores. Higher duration of weekend moderate and vigorous PA increased children's BMI Z-score significantly ($p < 0.01$). Children who were sedentary for 3 hours or more on a weekday had significantly lower BMI Z-scores ($p < 0.01$). A more critical discussion of these findings is presented in section 6.4.

2. Is there a difference between home environments among socio-economic variables (SES areas and income) in Cairo, Egypt?

Anthropometric data revealed that no significant differences existed between children from different SES areas and income groups. However, the highest number of overweight/obese children – measured by BMI Z-score - were found in the higher middle SES area (40%, n = 44), while the prevalence of overweight/overweight WtHRs was similar across all three SES areas.

Food environment data revealed that healthy and unhealthy food availability differed between SES areas ($p < 0.001$ and $p < 0.001$, respectively) and between income groups ($p < 0.001$ and $p < 0.001$, respectively). The higher the SES area and income area, the greater the amounts of healthy and unhealthy food items at home. Parental food modelling scores decreased with increasing SES area level ($p < 0.001$). Higher middle SES households had the healthiest eating and preparation habits score ($p = 0.025$).

PA environment data revealed that outdoor area characteristics were significantly healthier in higher middle SES and high income households (both $p < 0.001$). The number of media items at home significantly increased with increasing SES area and income (both $p < 0.001$), as did parental PA modelling scores ($p = 0.006$ and $p < 0.001$, respectively). Both middle SES areas had higher mean active play allowance scores than the low SES area ($F = 12.066$, $p < 0.001$). Lower middle SES area caregivers practiced more moderate media restrictions and rewards than their low SES and higher middle SES area counterparts ($p = 0.002$ and $p = 0.001$, respectively). Low income caregivers practiced more moderate media restriction scores than caregivers from other income groups ($p = 0.012$).

High income children practiced significantly higher average moderate/vigorous PA levels than low income children on weekends ($p = 0.032$). Low middle SES area children practiced the highest average SA while the low SES area had the lowest average SA on both weekdays ($p = 0.023$) and weekends ($p = 0.009$).

Caregiver BMI and WtHR differed significantly with respect to SES areas (both $p < 0.001$). Lower middle SES area caregivers had the highest mean BMI ($p < 0.001$) and WtHR ($p < 0.001$). Mean caregiver WtHR increased with increasing income group ($p = 0.015$). Low SES households had the healthiest smoking scores ($p = 0.027$) whereas low middle SES households had the unhealthiest. Low SES children slept significantly more on weekends than their middle SES area counterparts ($p < 0.001$).

3. *What are the maternal perceptions of obesity and PA in Egypt?*

The majority of caregivers perceived themselves to be overweight or obese. While the majority correctly identified their overweight/obesity, the few who overestimated their weight (they had healthy weights) were middle SES mothers. The majority were also concerned about their own weight but mainly for external pressure, duties, expectations (particularly low SES caregivers) and aesthetics (particularly middle SES area caregivers). The whole interview sample agreed that obesity was an adult woman's issue in Egyptian society. They mainly identified female relatives as overweight/obese and attributed women's obesity in Egypt to numerous factors, chiefly their dietary intake and also lack of exercise coupled with their maternal and career duties. The sample did not perceive their children to be overweight or obese regardless of their own weight status, and most did not perceive obesity to be a childhood issue in Egypt – despite a few citing infancy and late childhood as potential periods of overweight in children. Caregivers attributed childhood obesity to dietary factors (lack of an eating schedule and parents over-feeding their children). Caregivers were concerned about their child's weight gain, particularly if it were the daughter, as overweight would reduce her future chances of marriage and have an effect on aesthetics (this was not too important with respect to boys). Moreover, caregivers were divided as to which socio-economic category they regarded as being most at risk of obesity. While some cited that upper SES households were more prone due to abundant food and junk food, others cited low SES households as more prone due to them eating whatever is cheap and filling.

When asked about diet and exercise, a large number of caregivers believed both were equally important to children's health, believing they complemented one another. Low SES households were more likely to suggest PA was more important, while middle SES households were more likely to cite good nutrition as more important. However, both emphasised eating well, which indicates that dietary factors are first and foremost in Egyptian culture. Most agreed that their child's PA was important to them, citing health, social benefits and aesthetics (particularly for girls). On the whole, caregivers were satisfied with their children's PA, although some middle SES caregivers reported not being satisfied. Many reported their children's schools did not do enough to promote PA - some schools had no PE programmes - instead focusing on academic achievement.

4. ***What are Egyptian children's diet and PA experiences and do these differ between SES areas?***

Egyptian children eat three meals a day regularly. The typical breakfast regardless of SES consisted of bread in some form (white, baladi, buksumat) and cheese, milk and tea with sugar. Low SES households opted for cheaper more filling breakfasts such as foul and ta'ameya, while middle SES households opted for eggs, and sometimes chocolate spread, cakes, and sweets. Egyptian lunches mainly consisted of meat (chicken or beef), rice (alone or in dolma) and local vegetable dishes all together, and fruit as dessert. Salty food (mekhalel) was abundant particularly in lower SES households. While low SES areas used cheap ghee for cooking, middle SES households used corn/sunflower oil. Low SES areas reported sometimes eating what was available at home, while middle SES households indulged in unhealthy desserts such as chocolate, sweets and crisps. Dinners were reported as being smaller than other meals, with low SES areas eating whatever was left over from lunch. While most households (regardless of SES) reported eating yogurt as an option, low SES households reported eating cheap, satiating unhealthy feteer or halawa, while middle SES households reported eating cake or pizza. Children were the family members who were most likely to have snacks, such as chocolate and crisps. Lower middle SES children were most likely to have fruit or fruit juice as snacks.

With respect to PA habits, most children played football in the neighbourhood or at school, but low SES and lower middle SES children rarely engaged in school extra-curricular activities. Children from the three SES areas practised PA, but these differed within the SES area in question. All children from different SES areas engaged in active play, and all helped with housework. Higher middle SES area children were exposed to PA encouraging environments through family activities - frequent visits to the parks and sporting clubs - but did not walk or cycle to their schools which were far away. Lower SES area children had less exposure to PA encouraging environments through their families, who did not do any group PA due to illness, time and financial constraints, but practised PA through other activities such as walking to their nearby local schools and playing in the neighbourhood.

The following sections discuss the findings with respect to the main categories in this study's plan, itself generated from Gattshall et al.'s (2008) model, examining the home food environment, the home PA environment, PA/SA levels and caregiver obesity and smoking. Another section was added examining parental perceptions of obesity, diet and PA.

6.3 Childhood Overweight and Obesity Prevalence

Anthropometric data revealed that 37.8% of reference children (n = 79) had healthy/thin BMI Z-scores (under 1 SD), while 9.6% were classified as underweight (n = 18). Moreover, 32.1% (n = 67) were overweight, and 21.5% (n = 45) were obese. With respect to WtHR, 50.7% (n = 106) had healthy WtHRs and 49.3% (n = 103) had at risk WtHRs. Both measures showed a highly significant positive correlation among each other, and findings revealed an almost similar divide between healthy/underweight and overweight/obese categories in both BMI Z-scores (47.4% healthy, 52.6% overweight/obese) and WtHR (50.7% healthy/underweight, 49.3% overweight/obese). Younger children had significantly higher overweight/obese WtHRs than older children (p = 0.001) and girls had significantly higher WtHRs than boys (p = 0.003), but no significant difference was observed in BMI Z-scores. No data on Egyptian children's WtHR exists, and data on BMI Z-scores have only been recorded on a national level in the EDHS (El-Zanaty & Way, 2009) from age 10 onwards. Prevalence in Egypt is higher than in England, where 2012 data found 28% of children aged 2-15 to be overweight and 14% of children aged 2-15 to be obese (Public Health England , 2015).

BMI Z-scores did not differ significantly by age group or gender, however WtHR scores were higher in younger children and in girls. The difference in WtHR may be because WtHR calculation is correlated with height, which may lead to WtHR over- or under-adjusting for height's effect on different age groups (Tybor, Lichtenstein, & Must, 2008). Tybor, Lichtenstein & Must's (2008) study of 2-18 year old US children and adolescents reports that WtHR is over-adjusted in very young children (aged 2 years). In this study, children aged 2-5 years old had the highest WtHRs, and given that 60.4% of that age group were girls, this could account for the significant WtHR difference in gender. The differences and relationships between BMI Z-scores and WtHR may also be due ethnicity, as mentioned in Goulding et al.'s (2010) pilot study of three different ethnicities of New Zealand children aged 5-14. This study revealed that ethnicity influenced the relationship between both anthropometric measures, where Pacific and Maori children had higher WtHRs and therefore higher abdominal obesity than their European counterparts, while the BMI Z-scores were similar across all three ethnic groups. Given that studies in Egypt on childhood obesity are quite rare, the relationship between WtHR and BMI Z-score among Egyptian children and a probable ethnic factor behind WtHR is unknown.

No significant differences between socio-economic variables were found with respect to children's WtHR and BMI Z-scores. Although few studies have examined childhood obesity in Egypt, this study's findings differ from the EDHS findings that wealth was positively associated with adolescent boys' and girls' weight (El-Zanaty & Way, 2009). This study's findings also differ from studies in developed countries which show that overweight and obesity risk is highest among low SES groups (Song, 2006; McLaren, 2007; OECD, 2012; Drewnowski, et al., 2013). This finding might be explained by the qualitative findings, which revealed that both higher and lower SES area children experience PA and food environments which both promote and prevent healthy weight but in different ways. With respect to food, higher SES households had higher numbers of both healthy and unhealthy food at home. Children in higher SES households ate unhealthy imported and more expensive food options (waffles, crepes), while children in lower SES households ate food prepared with cheap unhealthy ghee. With respect to PA, children in lower SES areas walked to their nearby schools and played football on the street, but did not visit sporting clubs or parks. Higher SES children rode to school (bus, car) although they play sports in extra-curricular activities or in sporting clubs. Quantitative findings also found children of higher SES households to engage in greater SA, which might be due to the reported higher amounts of media items found in higher SES households. Additionally, studies in developed countries attribute obesity's link with low SES to not being able to afford buying and eating healthy food (Travers, Cogdon, & McDonald, 1997; Drewnowski & Darmon, 2005; Power, 2005; Wilson, 2013), but fruit and vegetables in Egypt are abundant, locally grown, cheap, and central to Egyptian cuisine (Hassan-Wassef, 2004) regardless of SES.

6.4 The Home Environment

This section discusses findings of the study with respect to the study's original model and theoretical underpinnings, namely the SEM and in particular Gattshall et al.'s (2008) model. The section is broken down into the food home environment and the PA home environment accordingly.

6.4.1 The Food Home environment

Analysis of both quantitative and qualitative studies revealed that several aspects of the home food environment were significantly associated with childhood weight. Univariate analysis found greater accessibility to healthy foods to be correlated with lower WtHRs in children but this was rendered non-significant after adjusting for age and gender. The resultant non-significant relationship was not in line with numerous studies' findings that greater accessibility to healthy food items translated to healthy weight in children (Ledoux, Hingle, & Baranowski, 2011; Saelens, et al., 2012; Boles, Scharf, Filigno, Saelens, & Stark, 2013). Greater accessibility to unhealthy food items were negatively correlated to WtHR. It was a surprising finding, contradicting studies that have shown unhealthy food at home to be correlated with high unhealthy food intake in young people (Patterson, Kristal, Shannon, Hunt, & White, 1997; Raynor, Polley, Wing, & Jeffery, 2004; Boutelle, Fulkerson, Neumark-Sztianer, Story, & French, 2006; Campbell, et al., 2007; Pearson, et al., 2012). Results indicate that accessibility to unhealthy food items may not necessarily mean the child eats them, and this increasingly points towards parental and cultural controls as potential factors.

The qualitative study offers a cultural insight into this. Semi-structured interviews revealed that fruits and vegetables were cheap and readily available and used often in traditional meals, regardless of socio-economic status of households. Both healthy and unhealthy food items were plentiful in most households in the quantitative study, and were abundant in all households as reported by the caregivers in the qualitative interviews. However, the qualitative interviews revealed a difference in the type of unhealthy food found in households with respect to SES areas. In low SES area households, these unhealthy food items were cheap and filling, such as ghee, pickles and white bread. In higher SES area households, unhealthy foods were pricier, imported foods and delicacies, such as cakes, pizza and waffles. Moreover, another reason why accessibility was negatively correlated to WtHR may be that in the interviews, caregivers often mentioned that Egyptian parents overfed their children. This may indicate that parental food control might be a factor behind obesity, especially in young children who cannot easily access healthy or unhealthy food. This is also in line with the quantitative finding that younger children were significantly more prone to overweight than their older counterparts.

Food physical environment analysis revealed that healthy and unhealthy food amounts at home were significantly higher in higher middle SES areas and high income areas. This is expected, as higher income/SES households would be more financially able to accumulate greater amounts of food at home. However, children in higher middle SES areas had less accessibility to unhealthy food items despite huge availability at home. Qualitative findings indicate that high SES households do have amounts of unhealthy food such as salty, sweet snacks, chocolates, cakes - the food items investigated in the HHS. Caregiver interviews indicated that low SES households stocked unhealthy food items. These food items were more traditional, cheap and filling, such as bread, ghee for cooking, salted pickled vegetables and traditional sweets. Qualitative analysis seemed to indicate that affordability in Egyptian households determined the type of unhealthy food stocked/consumed by caregivers and their families.

The quantitative investigation of the food social environment revealed that none of the scores were significantly correlated to BMI Z-score or WtHR after adjusting for age and gender. This was a rather unexpected finding, since existing positive associations between cohesive family dinners and healthier eating habits (Gillman, et al., 2000; Franko, et al., 2008; Kalavana, Lazarou, & Christodoulou, 2011) and inverse associations between cohesive dinners and overweight/BMI in childhood & adolescence (Taveras, et al., 2005; Gable, Chang, & Krull, 2007; Hammons & Fiese, 2011; Larson, Wall, Story, & Neumark-Sztainer, 2013) have been documented often. These findings are also surprising given the reported positive associations between food restrictions/pressure and BMI (Faith, et al., 2004; Webber, Hill, Cooke, Carnell, & Wardle, 2010). This might be due to cultural factors, whereby there is high family cohesion in mealtimes. The quantitative study revealed that 86.6% (n = 181) of households interviewed had cohesive family dinners 6-7 days a week, and cohesive family meals were reported by caregivers in the qualitative interviews, in addition to the already studies which highlight the closeness of families in Egyptian culture (Aldinger & Bauernfeind, 2001; U.S. Library of Congress, 2011). This may have created a ceiling effect thereby rendering no significant association between cohesive family eating and childhood weight.

Significant differences between SES areas in parental food modelling, parental food policies, and eating and preparation habits were found in the HHS. Parental food modelling scores were most healthy in low SES and low income households. Studies have shown that parental food modelling is dependent on cultural factors such as food habits practised (Contento, 2011; Salvy, Elmo, Nitecki, Kluczynski, & Roemmich, 2011) and in Egypt, eating healthy (fruit and vegetables) is affordable, and used often in traditional meals (Galal, 2002; Hassan-Wassef, 2004). Qualitative analysis revealed that traditional meals were cooked often, regardless of SES area, and meat was also consumed in larger amounts by households in higher SES areas. However, qualitative findings revealed lower SES households frequently used fattening/cheap ghee, a quite affordable cooking option. The parental food policies score was also significantly healthier in lower SES area households, which might be due to their inability to afford or restrict/reward unhealthy food items which are not initially found at home. This finding was verified by the lesser amounts of unhealthy food in these households in the food availability section. Moreover, a regular response by low SES caregivers to meal content in the qualitative interviews was 'Whatever is available'. Eating habits and preparation scores were healthier in higher middle SES area households, indicating greater consumption of food at home with the family. Qualitative and quantitative findings both revealed that family cohesion during mealtimes was high, and this is in fact typical of a collectivist culture which emphasises family (Aldinger & Bauernfeind, 2001; Rudy & Grusec, 2006; U.S. Library of Congress, 2011). Although the family cohesion has a huge potential to transfer healthy eating habits to children, qualitative findings seemed to indicate that meals lacked a set schedule, and were dense. The HHS revealed that having meals while watching TV was practiced often by children on both ends of the examined SES spectrum. In low SES area households this may be due to the poor outdoor area characteristics and also the low family cohesion, and in higher SES areas this may be due to the higher media availability at home.

Many interesting findings about children's dietary patterns were derived from the qualitative study. With respect to dietary habits, it was revealed that Egyptian families and children, regardless of SES, usually had three meals. Both breakfasts and lunches were quite dense, and contained a large amount of bread, as well as eggs. Higher SES households provided more calorific options such as chocolate. Quantitative findings supported this finding, reporting high quantities of unhealthy food items at home. Lunches in Egypt were the densest meals of the day in all households. Vegetable meals were very common in households regardless of SES area, but meat, particularly chicken and beef, was consumed more often by higher SES households who could afford it. Quantitative findings support the higher availability of all food items in higher middle SES households in the quantitative section. Dinners, which were lighter in all Egyptian households, also relied on affordability, with lower SES households not eating much or eating leftovers of the day. The qualitative findings support the already existing - albeit few – studies examining dietary habits of

Egyptians (Galal, 2002; Hassan-Wassef, 2004) with respect to sizes of different meals and content. Responses added to these findings by revealing a socio-economic difference in the types of unhealthy food consumed. Whereas low SES households consumed bread, pickles, halawa and cooked their food in local ghee, high SES households indulged in chocolate, cakes, pizza and waffles. Regardless of SES, Egyptian children are exposed to a variety of unhealthy foods, cheap/local or costly/imported, across SES.

Although households (especially higher middle SES households) reported greater family cohesion at meal times, which was found to be positively associated with eating habits (Gillman, et al., 2000; Franko, et al., 2008; Kalavana, Lazarou, & Christodoulou, 2011) perhaps the quality and density of meals and irregular meal patterns (mentioned by a few middle SES household caregivers in the semi-structured interviews) may negatively counter this. Irregular meal patterns have been shown to be predictors of obesity in children and adults in developed countries (Lehto, Ray, Lahti-Kosky, & Roos, 2010; Mesas, Munos-Pareja, Lopez-Garcia, & Rodrigues-Artalejo, 2012; Pot, Hardy, & Stephen, 2014). Several caregivers reported that Egyptian parents overfed their children. The mentioned parents were seen to interpret 'eating well' referring to quantity of food rather than to quality. The tendency of caregivers to overfeed their children is potentially obesogenic, as such behaviours may negatively influence children's satiety and hunger regulation cues which may put them at risk of overweight (Faith, et al., 2004; Lindsay, Sussner, Kim, & Gortmaker, 2006; Contento, 2011). Other parents complained about a general lack of family eating schedules in recent times as compared to their own childhoods when meal times were more organised. They attributed this to the modern style of living. Even though family cohesiveness may be beneficial, the structure and quality of meals in studied Egyptian households shows how families have the potential to help or hinder childhood obesity. Such an unhealthy attitude of over-feeding their children is worsened by caregivers' belief that children's good nutrition, which they may misinterpret, leads to a healthy weight.

6.4.2 The PA Home Environment

Quantitative data revealed the majority of children exceeded the recommended levels of moderate/vigorous PA (60 minutes a day) on weekdays (80.8% of the sample, n = 168) and weekends (81.3% of the sample, n = 169). This included 82.7% of boys and 78.4% of girls. Although there are no national scale studies in Egypt on childhood and adolescent PA, the reported numbers are considered high compared to recent UK data (Townsend, Bhatnagar, Wickramasinghe, Scarborough, & Foster, 2012) which revealed that only 32% of boys aged 2-15 and 24% of girls aged 2-15 met PA recommendations. However, since children's PA was reported by caregivers, they may have over-reported their child's PA levels. Moderate/vigorous PA levels on weekends were positively associated with childhood BMI Z-scores, although recommendations to reduce obesity specify at least 60 minutes of moderate/vigorous activity a day to combat conditions such as obesity (Health Survey for England, 2008). This may also be due to caregivers over-reporting their children's PA, particularly parents of overweight/obese children who might have given a socially desired response. This is itself one of the drawbacks of a face-to-face survey (Mc Coll, et al., 2001). Weekday SA levels were negatively correlated to BMI Z-scores in the quantitative findings which was unexpected, given the literature on effect of various types of media usage and adolescent obesity (Kohl III & Hobbs, 1998; Robinson, 2001; Vandewater, Shim, & Caplovitz, 2004; Mendoza, Zimmerman, & Christakis, 2007; Wells, et al., 2008; Yi, Yin, Chang, & Xiao, 2012). Given these findings, and that SES and income did not show any significant relationships with childhood BMI and WtHR, this may indicate that another aspect of the home environment (perhaps the food environment) is a potentially more significant factor than PA levels in this context.

Weekend PA was practiced more often by children in higher income households, and weekday and weekend SA were higher in higher SES area and income children. The greater PA in higher income children is probably due to the significantly better home environment in high income/SES areas, which has been shown in numerous studies to promote PA (Mawle, 2006; Tappe, Glanz, Sallis, Zhou, & Saelens, 2013). Greater weekday SA levels are perhaps a result of greater media availability and influence in higher middle SES area households, which are associated with adolescent obesity (Kohl III & Hobbs, 1998; Robinson, 2001; Vandewater, Shim, & Caplovitz, 2004; Mendoza, Zimmerman, & Christakis, 2007; Wells, et al., 2008; Yi, Yin, Chang, & Xiao, 2012). It seems that perhaps the prevalence of greater SA opportunities is offset by outdoor quality and sporting opportunities. Qualitative results revealed that children (regardless of SES area) engaged in active play and a variety of sporting activities and PA. In low SES areas, PA opportunities and exercise involved walking to and from the nearby schools, and playing in the immediate neighbourhood (despite being undesirable). Children in higher SES areas used public or private transport to commute to school, but PA opportunities and activities included extra-curricular sporting activities offered at schools, and being members at sporting clubs.

Children's moderate/vigorous PA levels on weekends were significantly higher in households of higher incomes. This is supported by the study's findings of better outdoor environments in high SES and high income areas, and also by studies in developed countries which reveal that high SES areas are aesthetically attractive, have greater green spaces and are safer (Mawle, 2006; Tappe, Glanz, Sallis, Zhou, & Saelens, 2013). Qualitative analysis revealed that children in higher middle SES households had greater PA opportunities especially in sporting clubs. This might explain why children in these households practice higher weekend PA and also supports findings that suggest that availability and proximity to recreational facilities significantly impacts child PA (Burdette & Whitaker, 2004; Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008). Moreover, schools attended by higher SES area children tended to offer more sporting activities and extra-curricular activities, which might also enhance higher SES children's weekday PA. Quantitative results also found SA levels on weekdays and weekends to be significantly higher in higher middle SES children, which is supported by the higher availability of media items in these households. The qualitative interviews found that Egyptian children, regardless of SES, engaged in active play. The only difference among SES areas is the setting in which they do so. Children in low SES areas tended to play football in the neighbourhood street/area and walk to school, while higher SES area children played in sporting clubs and in school extra-curricular activities.

PA physical environment sub category scores - outdoor area characteristics and media availability – surprisingly were not significantly related to childhood weight. This contradicts studies linking healthier outdoor area characteristics to better PA and weight in children and adolescents (Burdette & Whitaker, 2005; Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008; Dunton, Kaplan, Wolch, Jerret, & Reynolds, 2009; de Vet, de Ridder, & de Wit, 2011; Evans, Jones-Rounds, & Vermeylend, 2012). Both outdoor area characteristic and media availability scores were statistically higher in high income and higher middle SES area households, a result which replicates findings of existing studies in developed countries (Pena & Baccalao, 2000; Mawle, 2006). The outdoor area characteristics score difference replicates findings that affluence translates into more encouraging outdoor environments for PA as well as reducing overweight/obesity rates (Ellaway, Macintyre, & Bonnefoy, 2005; Mawle, 2006; Evans, Jones-Rounds, & Vermeylend, 2012). Greater media availability is also expected due to affordability by higher SES areas to buy media items. Although the qualitative interviews did not examine outdoor area characteristics or media availability, they reported children to be exercising and playing regardless of their SES area, which may have affected the non-significant association between area characteristics and BMI Z-scores/ WtHRs. Qualitative interviews found the only difference between SES areas in PA was the setting in which children played/exercised. Children of low SES areas tended to play/exercise in their neighbourhoods and walked to their nearby schools. Low SES areas, examined in the quantitative survey, lacked features that encouraged PA. These areas had no usable sidewalk, heavy traffic, no yard equipment and are densely populated with narrow streets. Children in higher SES neighbourhoods had more opportunities in the immediate neighbourhood to play, yet they seemed to play more in schools and in sporting clubs where they were members. This might lead one to conclude that children in Egypt adapt to their surroundings and engage in active play outdoors regardless of the desirability of the area or the presence of media.

Data from the quantitative survey highlighted a significant difference in PA and SA between genders. Boys practised a significantly greater amount of weekday and weekend moderate/vigorous PA than girls. This finding reflects previous studies on adolescent girls PA levels in Egypt (lesser than boys) (Fahmy, Nebal, & El Hossein, 2006; El Derwi, El Shirbiny, & Atta, 2011), and also seems to highlight the cultural/religious PA limitation facing women (Walseth & Fasting, 2003; Dagkas, Jahromi, & Talbot, 2010; Al Mahroos & Al Roomi, 2001). The qualitative interviews also support this finding, revealed a difference in gender in PA. Girls were reported by their respective caregivers as sedentary and lazy. Despite caregivers' perception of girls being lazy and allotting them household chores as opposed to boys' outdoor errands, they exerted great pressure on their girls to remain thin to be desirable for marriage. This places girls at a disadvantage, where they need to conform to weight standards while adhering to cultural norms that prevent them from exercising as freely as their male counterparts. Parental reports also revealed an interesting gender difference, whereby boys were reported to be more active - especially in outdoor play - than girls, who tended to stay indoors. Quantitative findings confirmed that boys outperformed girls in PA levels. Such finding was not surprising in a gender-biased, patriarchal culture such as Egypt.

Within the PA social environment, correlation analyses revealed a significant positive correlation between parental PA modelling scores and child BMI Z-scores, as well as a significant negative relationship between childhood WtHRs in moderate media rewards scores. The positive correlation between parental modelling (caregiver's engagement in physical exercise, household having a gym member and frequency of being active in the presence of the child) further adds to the mixed findings regarding the relationship between parental PA and child PA (Moore, et al., 1991; Kohl III & Hobbs, 1998; Welk, Wood, & Morss, 2003; Gustafson & Rhodes, 2006; Spurrier, Magarey, Golley, Curnow, & Sawyer, 2008; Crawford, et al., 2010; Holm, Wyatt, Murphy, Hill, & Odgen, 2012). Also, a positive correlation was reported between parental PA modelling and children's PA on weekdays and weekends. These findings may be due to the caregivers' perceptions of their own PA; qualitative reports revealed that caregivers regarded their chores as PA, noting they did not have time for physical exercise (gyms, sporting activities). However, most caregivers in the qualitative interviews said they exerted large amounts of physical labour in their daily lives as workers, wives and mothers; in fact they perceived their duties as having practised enough PA. This was particularly noticed in low SES respondents, who worked in physically demanding and tiresome jobs. The negative relationship between moderate media rewards scores and WtHR was expected. Previous studies found that authoritative (moderate) parenting styles translated to healthier BMI in children (Berge, Wall, Loth, & Neumark-Sztainer, 2010; Franklin, 2012). When asked, caregivers revealed that they were very permissive and encouraging in allowing their children to play. Despite this, they still seemed to harbour the belief that girls were more sedentary by nature. This belief, coupled with cultural factors concerning women in Egyptian society, may hinder girls' play and PA levels. In Egyptian culture, it is usually boys who are allowed to play outdoors and run outdoor errands, while girls are given household chores. Culturally speaking, it is not desired for girls to play in streets and outdoors, but rather indoors (as discussed in the previous paragraph).

Quantitative data also revealed that parental PA modelling scores were significantly healthier in higher middle SES area and higher income households. Caregivers in higher middle SES households may have a better perception/awareness of the impact of PA and physical exercise, which is in line with studies from developed countries describing high SES areas as having greater access to PA opportunities and also perhaps inducing body dissatisfaction and awareness of health (McLaren & Gauvin, 2002; Morland, Wing, Roux, & al., 2002; McLaren & Gauvin, 2003; Baker, Schootman, Barnidge, & Kelly, 2006; Giles-Corti, 2006). Most caregivers in the qualitative study, regardless of SES areas, were concerned about their weight. However, the main reason behind failing to practice PA among most caregivers was time, and not SES based constraints.

The HHS revealed that active play allowance scores were significantly healthier in lower middle SES areas. This is unexpected, as generally the highest SES area would be perceived to be the safest for play and the most likely to promote PA (Ellaway, Macintyre, & Bonnefoy, 2005; Mawle, 2006; Evans, Jones-Rounds, & Vermeylend, 2012). Findings of the quantitative study were not reflected in the qualitative interviews, as most caregivers reported being quite encouraging and permissive with respect to active play. It is quite interesting that caregivers reported that exercise and active outdoor play were a boy's pastime while girls were perceived as sedentary and preferred indoor activities. Such a perception, coupled with cultural restrictions, may adversely impact girls' PA levels. The HHS also revealed media restriction and rewards to be the most moderate in lower middle SES households. Caregivers in the qualitative section reported that it was quite easy to persuade their children to stop watching TV; some even mentioned that their children were naturally very active. Qualitative findings also contradicted the quantitative study, as children's PA was perceived as important to most caregivers interviewed. Most found ease in persuading their children to exercise, and were disappointed at their child's school physical exercise programmes regardless of SES area or income. However, some parents showed a preoccupation with their children's academic achievement, seemingly an Egyptian parental trait, which seems to have influenced school decisions to reduce/eliminate PE programmes in recent years. It is perhaps this preoccupation that encourages parents to restrict childhood play and also persuade them to stop watching TV.

6.5 Caregiver Weight, Smoking and Sleep

Unlike previous studies on the relationships between caregiver weight (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997; Strauss & Knight, 1999; Foresight, 2007; NICE, 2006; Davis, McGonagle, Schonei, & Stafford, 2008; Whitaker, Jarvis, Beeken, Boniface, & Wardle, 2010), smoking (NICE, 2006; Chen, Beydoun, & Wang, 2008; Davis, McGonagle, Schonei, & Stafford, 2008; Chiolero, Faeh, Paccaud, & Cornuz, 2008; Must & Parisi, 2009; Kwon, et al., 2010), sleep (NICE, 2006; Chen, Beydoun, & Wang, 2008; Davis, McGonagle, Schonei, & Stafford, 2008; Chiolero, Faeh, Paccaud, & Cornuz, 2008; Must & Parisi, 2009; Kwon, et al., 2010) and childhood weight, none of these home environment factors were found to be significantly correlated with childhood weight in this study. When caregiver BMI was examined in the quantitative study, it was highest in lower middle SES households. Both low SES and higher middle SES households had lower average BMIs. Although most caregivers were overweight/obese, lower BMI in low SES households may be due to their physically demanding lives involving manual labour at home, noted in studies on developing countries (Bauman, et al., 2012; Macniven, Bauman, & Abouzeid, 2012). Although the qualitative sample did not have enough respondents to examine statistical differences in weight, the majority were overweight/obese and low SES women had the most overweight/obese BMIs, despite having physically demanding jobs as cleaners and janitors. Qualitative findings also revealed that most caregivers perceived themselves as being overweight/obese, even middle SES women with healthy BMIs. Despite this, they rarely took steps to rectify their weight due to marital and maternal duties. The high prevalence of obesity in caregivers in the quantitative survey, and the qualitative reports indicate that the reason behind maternal overweight may be more culturally, gender and marital-related than socio-economic. Ninety percent of quantitative respondents were housewives, indicating that they had more time on their hands than working women to engage in physical exercise. The qualitative findings indicated that women are pressured to remain thin to be desirable for marriage. After marriage, priorities shift to being the best wife and mother, and concerns about body weight slowly diminish. Moreover, the obstacles faced by women in Muslim cultures may prevent them from engaging in PA (Walseth & Fasting, 2003; Dagkas, Jahromi, & Talbot, 2010; Al Mahroos & Al Roomi, 2001), which may lead to their being overweight.

Smoking was practiced least in both low SES and higher middle SES households. This is probably again due to affordability and awareness issues. Higher middle SES households may have greater health awareness. Low SES households may not afford cigarettes or may prefer to purchase necessities despite cigarettes being quite cheap in Egypt. Sleep showed no significant relationship with childhood weight, but differed statistically with respect to SES areas, where low SES children had higher sleep durations on weekdays, which may be due to the lack of media availability at home.

One of the most interesting findings of this study's quantitative phase is that SES areas showed a greater significant variation in both home environment correlates than income. Such finding could be an indicator that in Egypt, income should not be the only representative variable of socio-economic status. Differences between SES areas are also reflected when examining the food content at home in the qualitative survey, where food availability and consumption depended mainly on affordability. The great differences between SES areas are in accordance with the great physical and social differences between

Egyptian SES areas recorded in previous studies (Sims, Sejoume, & El Shorbagi, 2003; Denis, 2006).

6.6 Maternal perceptions of obesity

Most caregiver reports highlighted a popular perception of obesity in Egypt to be mainly an adult woman's problem. Quantitative findings in Phase II supported such perceptions, as most of the 210 caregivers sampled were overweight or obese. Numerous studies on obesity prevalence in Egypt in the past decade also reported high overweight and obesity prevalence in Egyptian adult women (El-Zanaty & Way, 2009; WHO, 2010). Most caregivers perceived themselves to be overweight/obese, and while most overweight/obese women accurately perceived themselves as such, middle SES mothers with normal weights also perceived themselves as overweight/obese. This may be a middle SES issue due to potential exposure to and adoption of international ideals of thinness (they are international school staff/teachers) which are highlighted in several studies (McVey, Tweed, & Blackmore, 2005; McLaren, 2007). It is interesting to find that although caregivers perceived obesity as a woman's problem and perceived themselves as overweight/obese, they did not perceive obesity to be a serious problem among Egyptian children. The quantitative survey found a lesser prevalence of overweight/obesity in children than in caregivers, but found that 52.6% (n = 110) of children had overweight/obese BMI Z-scores and 49.3% (n = 103) had at-risk WtHRs. None of the caregivers interviewed in the qualitative interviews perceived their own children to be overweight/obese. Although their children may indeed fall within the healthy weight range, this finding may replicate and reflect previous studies which found that parents failed to perceive their own child's obesity accurately (Myers & Vargas, 2000; He, 2007; Towns & D'Auria, 2009; Taylor, 2012). The failure of parents to recognise their own children's overweight, coupled with their perceptions that Egyptian parents overfeed their children may prove harmful to childhood weight. Concern about childhood obesity was voiced and reported mainly by middle SES caregivers; low SES caregivers believed their children were thin by genetics/heredity and that this would not change with diet or exercise. This may potentially reflect a harmful perception, as children would be fed without considering obesity, which could impact their future - especially low SES groups in Egypt with physically demanding jobs – given obesity reduces productivity.

Younger female children were statistically more likely to have at-risk WtHRs. Reports from qualitative interviews showed that caregivers who reported obesity to be prevalent among Egyptian children cited it as a problem in relation to young and middle childhood. This age difference in weight may hint that parental policies and attitudes of children's food and PA may be a significant factor behind young children's obesity. The obesogenic parental control/behaviour is most likely the overfeeding trend among Egyptian parents, mentioned often in the interviews.

Not only are girls more overweight/obese, mothers were far more critical of their daughters' potential weight gain than of their sons'. Mothers perceived overweight/obese girls as physically undesirable for marriage, despite a cultural acceptance of excess weight among women in Egypt (Galal, 2002). However, this worry might stem from the fact that most mothers in the interviews were overweight or obese, and also due to them recognising the documented and overwhelmingly high prevalence in Egyptian women (El-Zanaty & Way, 2009; WHO, 2010). This biased focus on girls' weight being in the healthy range may have a negative impact on boys in terms of permissiveness. The quantitative study sample revealed that among the different child age categories examined, boys' average BMI Z-scores were slightly higher than girls among most age groups. Moreover, the fixation on girls' weight primarily for marriage and not for health purposes may lead girls' to give up healthy lifestyles when the goal of thinness – marriage – is accomplished. Most caregivers were in fact, overweight or obese, and life duties and priorities following marriage may be a factor in this trend.

Even though all caregivers seemed interested in knowing more about their children's health, access to research was difficult for low SES caregivers, as some were illiterate. Illiterate caregivers would find it hard to access information, except by means of spoken or visual media, which was already reported to be rare in low SES households. Caregivers who researched health issues used the internet mainly, which might expose parents to false information.

6.7 Limitations

This study presented various challenges and limitations in its' generation and during implementation of both phases. Being a pilot study in Egypt, these challenges were expected and detailed in sections 4.4 – 4.7. Additionally, the political situation in Egypt throughout this study has presented the researcher with some unforeseen complications. This section explains the various drawbacks experienced, and offers suggestions for further studies.

Several setbacks were encountered with respect to the choice of tool employed for the quantitative study. An extensive literature search and correspondence with several institutions revealed that there were very few reliable and valid tools that holistically examined the home environment in relation to children or obesity. The HHS - the tool adapted for this study's quantitative phase - only resulted in one publication in 2008, a joint effort between the researchers at the University of Leeds and the University of North Carolina who initially developed the HHS. This publication introduced the HHS to the researcher at the start of this study. Further correspondence with the researchers who developed the HHS throughout the study revealed that the HHS was undergoing constant amendments. However, no further research has been published since the 2008, and neither were any details of any changes or amendments made to the HHS. Moreover, the HHS had no existing coding scheme, which further complicated the study as the researcher had to generate a bespoke coding scheme according to recent literature and studies on the home environment. Despite this being a challenging task, it was a very enriching experience for the researcher.

In addition, a limitation in the HHS scoring involved the healthy and unhealthy food availability sections, ideally measured and assessed using guideline daily amounts and calories. In this study, assessment of calorific content was not possible given the HHS questions (which were phone based and had used serving sizes and cups) and the difficulty of measurement in Egypt where nutritional value is not necessarily placed on several food items and where food is often bought in bulk/weight (namely kg). Given these challenges, the study instead used the reported weights (kg) of foods. A threshold of g/day/number of people per household of both healthy and unhealthy food items were calculated for each household using the NHS Eatwell Plate (British Nutrition Foundation, 2013) and the ratios of actual amounts of food to desired amounts of food determined how healthy each household was.

The absence of Egyptian tools examining the home environment made it challenging to adapt the HHS for face value, even with the help of the very capable Egyptian researchers at El Zanaty & Associates. This was an expected issue in cross-cultural application of surveys. The researcher did their best to adapt the HHS to accurately fit the Egyptian home environment. With respect to the choice of SES areas, one of the main setbacks was the inability to access the high SES areas in gated communities outside Cairo for security reasons. These areas have got a very special setup where it is so difficult to access. Random sampling would have been extremely difficult in those areas. Moreover, the cultural political situation in Egypt made it even more difficult to reach these high SES areas given the insecurity and suspicion in allowing strangers into the home. It would have been very interesting if high SES areas were included, but doing so was difficult without compromising random selection of the study.

Randomly choosing households proved impossible, as a deprivation index did not exist in Egypt's case, and that some of the streets in Cairo's low SES shanty towns were not labelled. The sampling procedure decided upon was the systematic method that provided no bias given the circumstances, yet it did not provide a random opportunity for the residents to have an equal chance of being selected. This selection method, particularly for these areas, was used by El Zanaty & Associates in the EDHS.

The quantitative surveys presented several challenges. The first was that the survey took only into account caregiver observations, without actually observing household interactions or examining reference children first-hand. The researcher would have wished to be able to access the homes involved rather than the female research assistant, but as mentioned previously this was impossible due to cultural and religious factors. It is unprecedented that a male stranger enters the household and communicates and measures the female caregiver. This was contrary to the rich experience the researcher gained by administering the qualitative interviews himself. Another limitation of the survey administration was the lack of a measure of inter-observer reliability particularly in the observation of fresh fruit in the living room.

The quantitative survey aimed at examining the differences between home environments with respect to two socio-economic variables: SES area and income. With respect to SES areas, 70 households were chosen from each of the three SES areas investigated. With respect to income, many households reported low and middle incomes, while much fewer households reported higher incomes. More high income households should have been measured – even though these households were probably more abundant in the high SES areas which were omitted from selection.

The sample data also revealed that older children were more likely to be boys and younger children were more likely to be girls, despite the child being selected randomly within each household. Such findings could not be avoided, but the researcher made the best use of the given data by applying regression models which aimed at examining the potential impact that age and gender might have on the results.

In the qualitative phase, the researcher aimed to investigate the diet and PA experiences of Egyptian families. Since no study previously examined this in Egypt, the researcher tailored a semi-structured interview from various questionnaires. One of the major limitations to the qualitative study was the inability to access the same households in the quantitative survey. It would have been quite interesting to access the same households as the quantitative study, but two main challenges were presented. Firstly, following the 2011 revolution, it was extremely difficult to access households due to the ensuing political turmoil. Secondly, had the same households been sampled, the interviews would have been conducted once again by the female research assistant, which would have deprived the main researcher from gaining a first-hand insight into the culture. Although the sample interviewed in the qualitative survey consisted of working mothers, who were not representative of the majority of the quantitative sample (housewives), the qualitative interviews provided a valuable insight into the Egyptian culture.

Finally, children of the caregivers could not be reached in the qualitative phase for anthropometric measures. This phase thus relied on parental perceptions of their children's weight, which are prone to be inaccurate.

Chapter 7 Conclusions and Recommendations

7.1 Chapter Overview

This chapter presents a brief section describing conclusions of this study. Based on the study's findings, the chapter then offers resulting recommendations for both future research and for future policy and practice efforts aimed at tackling obesity in an Egyptian context.

7.2 Conclusions

Anthropometric data revealed that 32.1% ($n = 67$) of reference children had overweight BMI Z-scores while 21.5% ($n = 45$) were obese. Moreover, 49.3% ($n = 103$) of reference children had at risk WtHRs, and older age groups ($p<0.01$) and boys ($p< 0.05$) had significantly lower WtHRs.

Home environment variables which had a significant relationship with childhood weight included unhealthy food accessibility ($p < 0.01$) as a negative predictor of WtHR, and higher parental PA modelling which significantly increased children's BMI Z-scores ($p < 0.05$), and practicing moderate media rewards, associated with lower child WtHRs ($p < 0.01$). Higher duration of weekend moderate and vigorous PA increased children's BMI Z-score significantly ($p < 0.01$). Children who were sedentary for 3 hours or more on weekdays had significantly lower BMI Z-scores ($p < 0.01$).

When examining the difference between home environments between socio-economic variables, data revealed that healthy and unhealthy food availability was higher in higher SES areas ($p < 0.001$ and $p < 0.001$, respectively) and higher income groups ($p < 0.001$ and $p < 0.001$, respectively). Parental food modelling scores decreased with increasing SES area level ($p < 0.001$). Higher middle SES households had the healthiest eating and preparation habits score ($p = 0.025$). Outdoor area characteristics were significantly healthier in higher middle SES and high income households (both $p < 0.001$). Media items at home increased with increasing SES area and income (both $p < 0.001$), as did parental PA modelling scores ($p = 0.006$ and $p < 0.001$, respectively). Middle SES areas had higher mean active play allowance scores than the low SES area ($F = 12.066$, $p < 0.001$). Lower middle SES area caregivers were more moderate in media restrictions and rewards than low SES and higher middle SES area caregivers ($p = 0.002$ and $p = 0.001$, respectively). Low income caregivers practiced more moderate media restriction scores than caregivers from other income groups ($p = 0.012$). Children from high income households had higher average moderate/vigorous PA levels on weekends ($p = 0.032$). Low middle SES area children had the highest average SA. Lower middle SES area caregivers had the highest mean BMI ($p < 0.001$) and WtHR ($p < 0.001$), and mean WtHR increased with increasing income group ($p = 0.015$). Low SES households had the healthiest smoking scores ($p = 0.027$) and low middle SES households had the unhealthiest. Low SES children slept more on weekends than middle SES area children ($p < 0.001$).

Data on maternal perceptions of obesity revealed that most of caregivers interviewed perceived themselves as overweight/obese while some middle SES caregivers overestimated their (healthy) weight. Their concern about overweight stemmed mainly from external pressure, duties, expectations (mainly lower SES respondents) and aesthetics (mainly middle SES area respondents). All caregivers labelled obesity as an adult woman's issue, especially identifying female relatives as overweight/obese, and attributed it to dietary intake, lack of exercise, and maternal and career duties. The sample did not perceive their children to be overweight or obese, and most did not label obesity as a childhood issue in Egypt. Caregivers attributed childhood obesity to dietary factors (lack of an eating schedule, over-feeding). Caregivers were especially concerned about their daughters' weights to better their aesthetics and chances of marriage. Some caregivers believed that upper SES households were more prone to obesity due to abundant and junk food, while others believed that low SES households that eat whatever cheap and filling options, was more prone. Most caregivers believed diet and PA were equally important to children's health, but low SES households were more likely to cite PA as more important and middle SES households were more likely to cite nutrition. Most believed that their child's PA was important for health, social and aesthetic (especially for girls) reasons. Caregivers were mostly satisfied with their children's PA.

Data on dietary habits revealed Egyptian children eat three meals a day. Breakfast, regardless of SES, included bread, cheese, milk and tea with sugar. Low SES households ate cheaper and filling breakfasts (foul, ta'ameya) and middle SES households ate eggs, chocolate spread, cakes, and sweets. Egyptian lunches mainly consisted of meat, rice, local vegetable dishes, as well as fruit for dessert. Salty food (mekhalel) was particularly consumed by lower SES households. Middle SES households used corn/sunflower oil for cooking, and ate unhealthy desserts (chocolate, sweets). Low SES households cooked with cheap ghee and sometimes ate whatever was available at home. Dinners were smaller across the sample, with low SES area households eating leftovers from lunch. Most households ate yogurt for dinner, and some reported eating unhealthy options (low SES households ate feteer or halawa, middle SES households ate cake or pizza). Children were the most likely members to snacks (chocolate/crisps by middle SES houses and fruit/fruit juice by lower middle SES).

Data on PA habits revealed that most children engaged in active play (especially football in the neighbourhood or at school) while low SES and lower middle SES children rarely engaged in school extra-curricular activities. Higher middle SES area children's PA encouraging environment included frequent family visits to parks and sporting clubs, but distance of their schools did not allow them to walk or cycle. Lower SES area children engaged in little/no family outings to parks/clubs but practised PA through other activities such as walking to their nearby local schools and playing in the neighbourhood.

7.3 Recommendations

This study is considered a pilot study examining the relationship between the home environment and childhood obesity in Egypt. Several recommendations are concluded from this study's results, which could initiate further research in this field. These recommendations are as follows:

7.3.1 Recommendations for Future Research

- A need to properly address the issue of defining socio-economic groups and their characteristics in Egypt. This study examined two variables, the SES area and income. The study's results have shown greater significant differences between SES areas than between income groups. The lack of a clear definition of SES is a deficiency in social studies in Egypt due to existing research that fails to generate culturally specific definitions and boundaries. There is a strong need to define culturally appropriate correlates of SES in an Egyptian setting, and this study recommends SES areas to be considered as one of the primary correlates.
- There is a strong need to address components of the HHS separately in an Egyptian context. The HHS offers a holistic analysis of home environment correlates, which was much needed in western studies following decades of studies on each component separately. Alternatively, in Egypt, this study was the first to address home environment correlates. Examining each component of the HHS separately and in detail in an Egyptian context might in turn lead to the generation of a more culturally appropriate holistic tool based on the results of these individual studies, much like the HHS did in the UK and the USA.
- A research study should investigate in detail the contents of the Egyptian diet across all SES areas. This is one of the researcher's main goals following this study. The HHS was culturally designed to investigate Western dietary habits. Even though the HHS was modified for face value, it only investigated availability and accessibility of food. A study which examines the cultural preparation of meals, their dietary content and eating habits would reveal a better and more accurate description of diet in the different SES groups in Egypt.
- A longitudinal study should investigate childhood weight from infancy to adolescence in Egypt. This study highlights a need to examine the development of childhood weight. The social environment (namely parental dietary interactions) should be closely followed.

- There is a strong need for an extensive qualitative investigation of the different perceptions of caregivers on obesity, namely gender differences and perceptions of healthy eating. This investigation should be inclusive of all SES areas. The predominant pressure on girls rather than boys to maintain a healthy weight for reasons other than health – namely marital – must be addressed in further research. The perception of healthy eating for children being equated to quantity rather than quality is another issue to be addressed.
- Concepts, perceptions and practice of physical exercise among caregivers in Egypt are issues that should be studied. Although caregivers acknowledged exercise as beneficial, they rarely exercised. There was a misperception of daily jobs and physical demands and household chores as PA.

7.3.2 Recommendations for Policy and Practice

- The Egyptian health authorities need to address family obesity by means of intervention programmes, which preferably include the whole family, particularly mothers and daughters. Food habits and parental food modelling, parental food policies, and perceptions of obesity need to be addressed and also education about obesity and its effects, as well as encouragement to practise PA especially for women and girls.
- There is a need for the responsible authorities to implement PA facilities directed particularly at girls and women to combat the high prevalence in both. This may include setting up women-only training facilities and sporting clubs to be able to practice in accordance with cultural norms.
- There is a need for the responsible authorities in Ministry of Education to re-introduce, implement and encourage PE programmes in schools, particularly governmental schools. Governmental schools, which cater to the majority of the low and middle SES areas, have little/no access to playgrounds or play facilities, due to lack of resources and overpopulation. Moreover, the Ministry of Education should

ensure that all children receive adequate, healthy food (fruit, vegetables, healthy meals) in school canteens.

- The Ministry of Planning should implement an urban redevelopment scheme focusing on improving low SES areas with undesirable qualities relating to PA, thus reducing socio-economic disparities which may lead to ill health. This study has shown a significant difference between SES areas in terms of Outdoor Area Characteristics, and thus the potential to encourage families and children to practice PA. It is thus essential to address these socio-economic differences to improve low SES families' access to better health.

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